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WAR MACHINE

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Armed Forces of the World: French Army (Part 2)

Hawker Typhoon in Action

Fighter-Bombers over Normandy

Support of the Desert Forces

A fully illustrated guide to Allied Ground Attack Aircraft of World War II

WAR MACHINE

Volume 2 **Issue 23**

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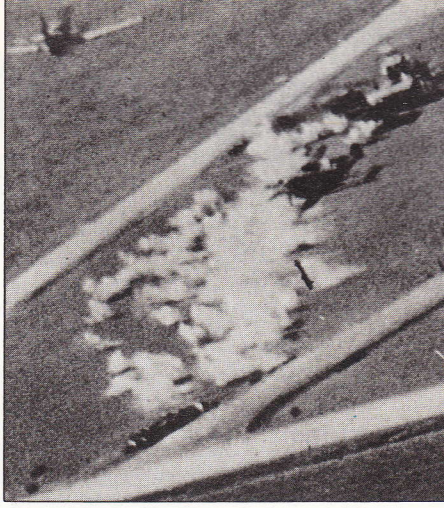
Allied Ground Attack Aircraft of World War II



As the Allied troops moved inexorably towards victory, fighters streaked across German installations ahead of the army, strafing all that came in their sights.

The early ground attack aircraft of the war were easy pickings for air and ground defences alike, but later designs overcame these deficiencies by strength and speed. Here we describe the main types employed by the Allies along with their development and deployment.

Continuing the 'trench fighter' concept of World War I, most fighters of the warring nations in World War II were adapted to carry weapons with which to support their ground forces, both over the battlefield itself or in the enemy's immediate rear. Although the ground support tactic had been pursued by the Luftwaffe as an inherent feature since its formation in 1934, and demonstrated by the Legion Condor during the Spanish Civil War, the Royal Air Force was slow to adapt its fighters as ground-attack aircraft, preferring to employ specialist light bombers in the task; and when its Fairey Battles were shown to possess neither the speed nor defence to survive enemy fighters and Flak, the Hawker Hurricane eventually took over, using guns and bombs in the cross-Channel sweeps that started in 1941.

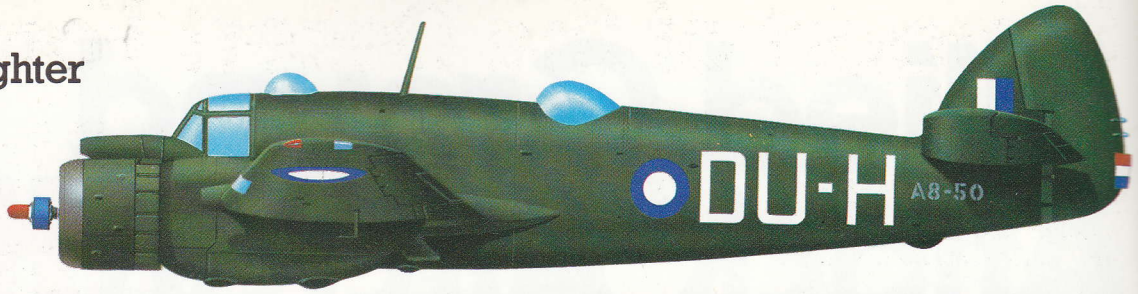
In the early stages of the war, however, the UK and her fast diminishing European Allies were thrown almost entirely on the defensive, and such campaigns were not conducive to the wastage of fighter aircraft in the ground-attack role, but rather in disputing enemy air superiority. Only when the Allies were ready to take the initiative, at first in isolated operations such as at Dieppe, and later in major campaigns in North Africa and ultimately throughout Europe, did the ground-attack aircraft really come into its own. All manner of specialist support tasks were undertaken, including bombing, rocket-firing, smoke-laying, tactical reconnaissance, anti-tank attack and so on. What had euphemistically been termed 'army co-operation' by the RAF for 20 years was now deemed to be a major strike element of the ground offensive.

The Hawker Typhoon, a relative failure in its original role as interceptor, was shown to be a devastating ground-attack fighter, and can now be seen as the prototype of a new generation of tactical strike aircraft, its rudimentary 76-mm (3-in) rockets presaging a new concept of artillery that would dominate the battleground of armour and entrenched or concrete defences. Indeed, the speed of land advances during the final year of the war in Europe and the Far East was directly proportional to the weight of tactical air support, whether by hordes of Soviet *shturmoviks* in the Ukraine or by Hurricanes over Rangoon.

A dramatic photo of a Desert Air Force Hawker Hurricane Mk IID using its wing-mounted 40-mm cannon against a German tank. Such scenes became commonplace over the battlefields of the later years of the war as the aircraft was recognized as a potent weapon against ground forces.

UK

Bristol Beaufighter



The Bristol Beaufighter was built in Australia and used by the RAAF against the Japanese in the Far East theatre alongside the RAF machines. They came to be one of the most effective attack aircraft in the Far East and their metal structure was suited to the climate.

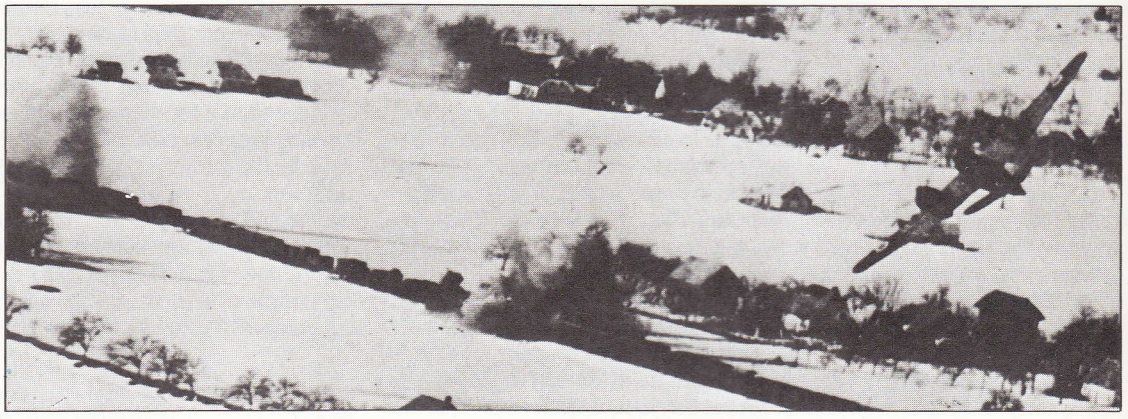
Originally designed and introduced into service as the RAF's first purpose-built twin-engine night-fighter in 1940, the **Bristol Beaufighter** was impressive from the outset as a rugged, powerful and heavily-armed aircraft. Its long-term success in this role was to some extent compromised by poor radar, however, and by the time this shortcoming had been overcome the de Havilland Mosquito night-fighter, with much improved performance, had arrived. Therefore, although remaining in service as a night-fighter overseas, from the autumn of 1942 the Beaufighter started service in the strike role.

As early as March 1941 a Beaufighter had undergone trials as a torpedo bomber, and in September 1942 a **Beaufighter Mk VIC** was first armed with rocket projectiles. Two months later the first Beaufighter anti-shipping strike wing was formed at North Coates, Lincolnshire, comprising No. 143 Squadron with fighters, No. 236 Squadron with bombers (carrying two 113-kg/250-lb bombs under the wings) and No. 254 Squadron with torpedo Beaufighters. The rocket-firing Beaufighters (dubbed the Flakbeau as its task during strike sorties was to attack defending Flak ships and batteries) entered squadron service in March 1943.

The first Beaufighter strike aircraft were all Mk VIs, although specific aircraft were designated for bomb-, rocket- or torpedo-carrying. In June 1943 the first **Beaufighter TF.Mk X** aircraft entered service with No. 39 Squadron in the UK and No. 47 Squadron in North Africa; this version, with nose-mounted ASV radar, could carry combinations of all these weapons and was particularly effective against Axis shipping in the Mediterranean in 1943.

It was in South East Asia, however, that the Beaufighter earned lasting fame as a strike fighter: here it was called 'Whispering Death' by the Japanese following a series of surprise strikes on enemy depots in the Burmese jungle. Early operations involved strikes against Japanese coastal shipping sailing along the Burma coast, but in due course, in the face of persistent attacks by the Beaufighters and other Allied aircraft, this traffic dwindled, leaving the Beaufighter free to engage land targets with cannon, rockets and bombs, a task they continued to perform right up to the end of the war.

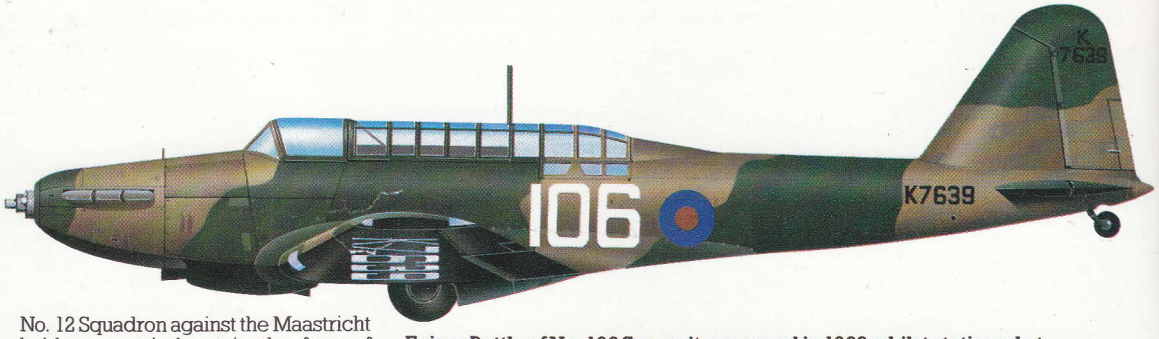
Specification
Bristol Beaufighter TF.Mk X
Type: two-seat strike fighter
Powerplant: two 1,770-hp (1320-kW) Bristol Hercules XVII air-cooled radial piston engines
Performance: maximum speed 488 km/h (303 mph) at 395 m (1,300 ft); climb to 1525 m (5,000 ft) in 3 minutes 30 seconds; service ceiling 4570 m (15,000 ft); range 2365 km (1,470 miles)
Weights: empty 7076 kg (15,600 lb); maximum take-off 11431 kg (25,200 lb)
Dimensions: span 17.63 m (57 ft 10 in); length 12.70 m (41 ft 8 in); height 4.83 m (15 ft 10 in); wing area 46.73 m^2 (503 sq ft)
Armament: four 20-mm Hispano cannon in nose and one 7.7-mm (0.303-in) machine-gun in dorsal hatch, plus either one 45.7-cm (18-in) torpedo, or eight 27.2-kg (60-lb) rocket projectiles, or two 227-kg (500-lb) and two 113-kg (250-lb) bombs



A German train is blasted by an RAF Beaufighter over Norway in 1943. The Beaufighter became the prime strike aircraft early in the war before such types as the Mosquito came to the fore.

UK

Fairey Battle



Fairey Battle of No. 106 Sqn as it appeared in 1938 whilst stationed at Abingdon. The Battle was extremely vulnerable to both air and ground fire due to its sluggish performance, and its combat career was cut short in 1940.

Envisaged as a replacement for the famous Hawker Hart and Hind light bombers of the early and mid-1930s, the **Fairey Battle** was selected as the cornerstone of the rapidly-expanding RAF and was intended to equip the large number of light bomber squadrons during the latter part of that decade. When the war started, however, the Battle was already obsolescent and was particularly vulnerable in the context of German *Blitzkrieg* tactics. Before the opening of the great German assault in the West on 10 May 1940, 10 Battle squadrons (Nos 12, 40, 88, 98, 103, 105, 142, 150, 218 and 226) had been sent to France to support the British Expeditionary Force, and were committed to action in the face of overwhelming enemy air superiority. Already unescorted daylight bombing operations had resulted in heavy losses (as early as 30 September 1939 four out of five No. 150 Squadron Battles had been shot down in a single raid), and, although escorts had been provided during the winter, little could be done to protect the slow bombers when the storm burst in the spring. Carrying no more than four 113-kg (250-lb) bombs at an operating speed of about 278 km/h (160 mph), the Battles were sent against key river bridges being used by enemy armoured columns advancing through Belgium. In an attack by No. 12 Squadron against the Maastricht bridges, carried out in the face of heavy Flak and fighter opposition, almost all the bombers were shot down, the RAF's first Victoria Crosses of World War II being awarded posthumously to Flying Officer D.E. Garland and Sergeant T. Gray. Four days later 71 Battles from Nos 12, 103, 105, 150 and 218 Squadrons were assembled for an attack on German pontoon bridges in the Sédan area; no fewer than 40 aircraft failed to return. The survivors of the squadrons were withdrawn from France, but several of them, based in England, continued to attack German-held ports on the Channel Coast until the threat of invasion receded. Thereafter the Battle was relegated to training and target-towing duties, many being shipped to Canada where they served with air gunnery schools.

The Battle was an anachronism and its shortcomings should have been anticipated long before the traumas of May 1940. It was, after all, powered by the same engine as the single-seat Hurricane, yet with a crew of three and 60 per cent heavier when fully-equipped, it was sent aganst single-seat fighters of twice its performance and expected to defend itself with only two rifle-calibre machine-guns.

Specification
Fairey Battle
Type: three-seat light bomber
Powerplant: one 1,030-hp (768-kW) Rolls-Royce Merlin II liquid-cooled V-12 piston engine
Performance: maximum speed 388 km/h (241 mph) at 3050 m (10,000 ft); initial climb rate 280 m (920 ft) per minute; service ceiling 7620 m (25,000 ft); range 1450 km (900 miles)
Weights: empty 3015 kg (6,647 lb); maximum take-off 4895 kg (10,792 lb)
Dimensions: span 16.46 m (54 ft 0 in); length 12.85 m (42 ft 1¾ in); height 4.72 m (15 ft 6 in); wing area 39.20 m^2 (422 sq ft)
Armament: one 7.7-mm (0.303-in) machine-gun in starboard wing and one 7.7-mm (0.303-in) machine-gun in rear cockpit, plus a bombload of four 113-kg (250-lb) bombs carried internally

Support of the Desert Forces

Following the great victory at Alamein, the Allies pushed forward at an impressive rate to drive the Axis forces out of Africa. In the forefront of this advance were the fighter-bombers of the combined forces, developing new tactics and creating havoc amongst the Axis supply and communication lines. These new tactics were to prove the foundations for the air war to be fought over the battlefields of Northern Europe.

One of the war's most spectacular advances was that performed by the British 8th Army following the great desert victory at Alamein on 3 November 1942, and which ended 1930 km (1,200 miles) to the west with German and Italian defeat at the northern tip of Tunisia in May 1943. In support of this advance were 93 squadrons of fighters, bombers, transports and other aircraft of the British, Commonwealth and US air forces, including some 730 Hawker Hurricanes, Supermarine Spitfires, Curtiss Kittyhawks, Curtiss Tomahawks and Bristol Beaufighters deployed in 42 squadrons under the overall command of Air Chief Marshal Sir Arthur Tedder. The vital part played by these tactical forces in support of the brilliant advance may best be summarized in the form of a brief diary of events. Simultaneous with the advance from the east, the great 'Torch' landings in Algeria and Morocco served to squeeze the Axis forces in North Africa between the jaws of a vast pincer.

23 October-4 November 1942: The Battle of Alamein. Early attacks by Hurricane Mk IICs (No. 73 Sqn, RAF) on enemy troop concentrations prevented their rapid deployment during the battle. Hurricane Mk IIDs of Nos 6 (RAF) and 7 (SAAF) Sqns destroyed more than 40 tanks of the German 15th and 21st Panzer Divisions between 24 and 28 October; losses among the Hurricane Mk IIDs (weighed down by guns, armour and bulky air filters) caused them to be confined to the southern area where Flak was lightest. Some 374 sorties by Hurricanes and Spitfires during 1-2 November supported the breakthrough by the 2nd New Zealand Division in the north. Total RAF sorties during the battle numbered 11,700, of which 5,100 were flown by the fighter-bombers (often in extremely bad weather), compared with 3,000 German and Italian sorties. Allied losses were 97 aircraft, those of the enemy about 80.

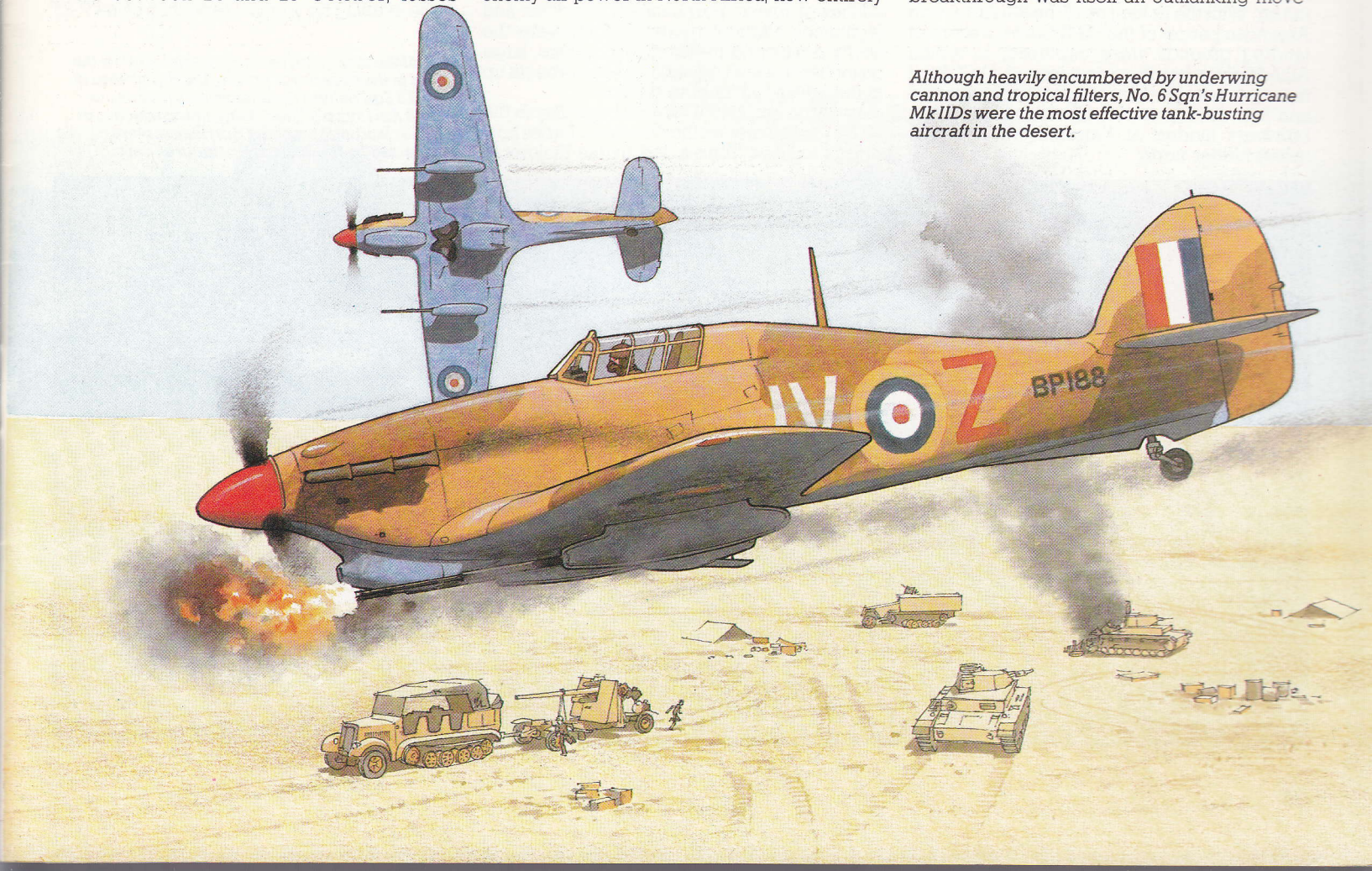
8-10 November 1942: The 'Torch' landings in North West Africa. Initial ground support by fighters was limited by lack of airfields, and after Axis occupation of Tunisia the enemy successfully retained the initiative in the air for almost four weeks.

11-13 November 1942: In the Western Desert, as British forces neared Benghazi, Air Marshal Coningham ordered two Hurricane squadrons (Nos 213 and 218) to land at an airfield in advance of Allied troops whence they were able to attack retreating enemy motorized columns, destroying or severely damaging some 300 vehicles.

23 February 1943: After a long spell of bad weather, preparations were made to destroy enemy air power in North Africa, now entirely concentrated on Tunisia and western Tripolitania. As the Axis forces pulled back to the Mareth Line, fighter-bombers of the Western Desert Air Force attacked enemy landing grounds at El Hamma, Gabes and Mareth, the British Hurricane and Kittyhawk bombers claiming the destruction of 47 German and Italian aircraft on the ground.

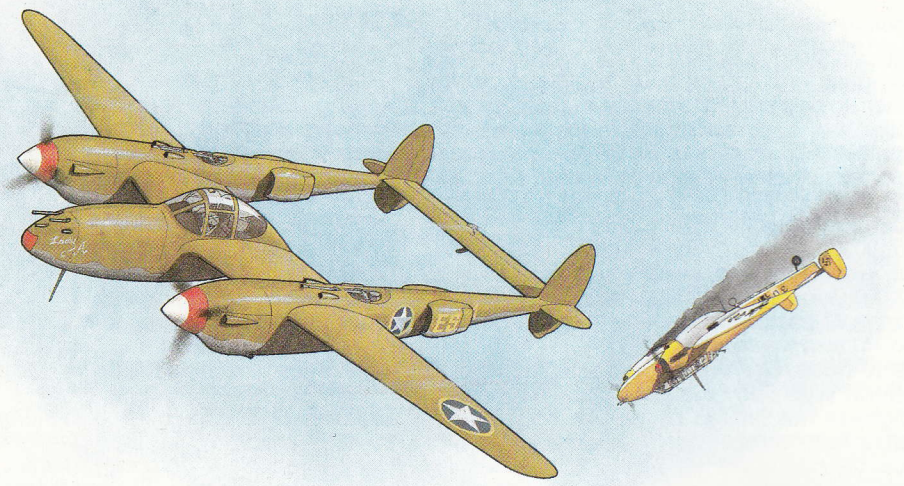
5-6 March 1943: At the battle of Medenine, with Allied air superiority firmly re-established, British and American fighter-bombers enjoyed free rein over Rommel's forces, contributing much to the ground victory. Co-operation between British and American air forces, hitherto lacking, now improved rapidly. Co-ordinated attacks from the east (by British Commonwealth squadrons) and from the west (by USAAF Warhawk, Lockheed Lightning and Bell Airacobra squadrons) gave the enemy no respite. The support aircraft of No. 242 Group flew more than 1,000 sorties in five days, claiming the destruction of 180 enemy vehicles.

21 March 1943: In the battle of the Mareth Line an early attack by the New Zealanders was threatened by a concentration of enemy armour until this was dispersed by anti-tank Hurricanes and Kittyhawk bombers. The battle raged on until 26 March when relays of Kittyhawks were ordered off to attack individual enemy strongpoints. As a creeping barrage preceded the assault by the British 8th Army, the Germans attempted once more to mass their tanks, and once more they were forced to disperse as the Hurricane Mk IIDs swept in with their 40-mm anti-tank guns. In the vital 150 minutes of the breakthrough, the fighter-bombers flew 412 sorties, destroying 71 tanks and other vehicles for the loss of 11 pilots. The breakthrough was itself an outflanking move-



Although heavily encumbered by underwing cannon and tropical filters, No. 6 Sqn's Hurricane Mk IIDs were the most effective tank-busting aircraft in the desert.

Lightnings were active over the desert in a variety of roles, but the roving attack role suited them best. This brought them into contact with German aircraft and they quickly put paid to their Bf 110 counterparts. This is a P-38F-1 of the 12th Army Air Force.



ment which constituted the classic 'left hook' involving swift pursuit of retreating enemy forces of which the fighter-bomber pilots took full advantage. As General Montgomery reported: 'The outstanding feature of the battle was the air action in co-operation with the outflanking forces.'

1-8 April 1943: A brief but fierce battle at Wadi Akrit, 80 km (50 miles) beyond Mareth, was followed by further pursuit of retreating enemy forces which were repeatedly attacked from the air. With the linking up of the 8th Army with American patrols of the US II Corps, a score of landing grounds were captured, to which Allied fighter-bombers now moved. On 7 April the important airfield at Mezzoun was captured and four days later Kittyhawk and Hurricane bombers landed at Kairouan 160 km (100 miles) further north.

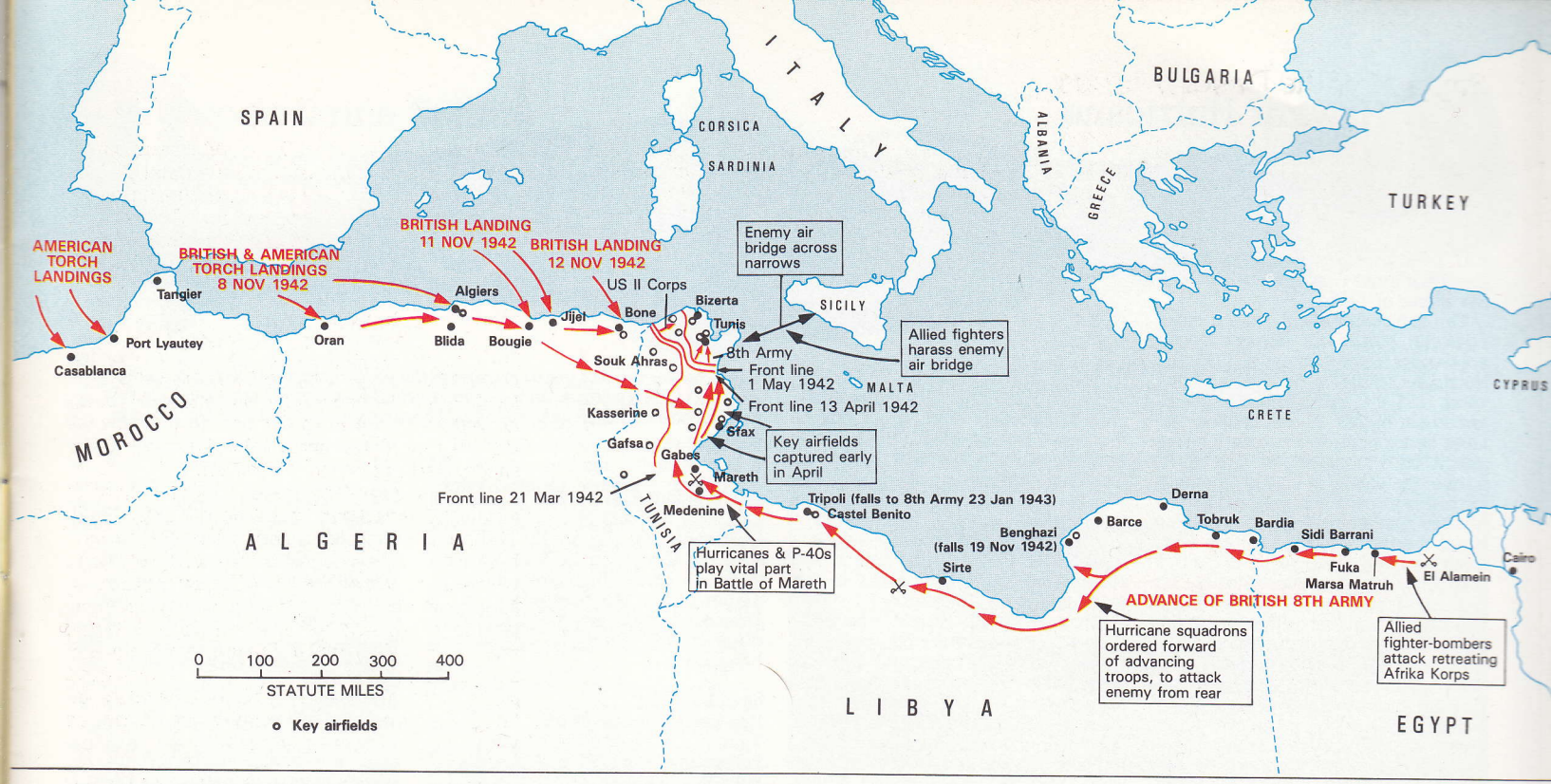
15 April-1 May 1943: With the whole of northern Tunisia within range of bomb-carrying fighters, the Allies now set about the systematic destruction of von Arnim's forces being violently contracted into an area measuring roughly 160 by 80 km (100 by 50 miles). Despite frantic efforts to provide fighter reinforcements from Sicily and elsewhere, the enemy's attempts to move fuel and other essential supplies by air into Tunisia proved costly in the extreme, for those transports that were not shot down over the Sicilian narrows had to survive the depredations of roving Hurricanes, Kittyhawks and Lightnings. Particularly devastating were the newly-developed fragmentation bombs, large quantities of which were now being brought up to the advanced landing grounds.

Partly on account of their vulnerability in the air and on the ground the enemy air forces now started to leave Tunisia, led by the Junkers Ju 87s and Henschel Hs 129s, leaving behind little more than a handful of Messerschmitt Bf 109s and Focke-Wulf Fw 190s to cover the main Axis concentrations at Bizerta and Tunis. The attempt to mount the air bridge between Sicily and Tunisia was also abandoned, Allied estimates of the number of enemy transport aircraft destroyed in the air and on the ground reaching 432 between 5 and 22 April. For a short spell during the month RAF fighter-bomber pilots were allowed the opportunity to try their hand against Axis shipping in the coastal waters of northern Tunisia and, despite a lack of formal training in this form of attack, succeeded in sinking 11 vessels.

The final assault on the enemy's last lines of defence opened during the night of 19/20 April. The bulk of tactical air support by the fighter-bombers was switched to the northern flank where an attack by the US II Corps resulted in a steady advance along the coast towards Bizerta. This was an occasion when disaster befell advancing American forces, accidentally attacked by about 30 US P-38 Lightnings whose pilots, by now well practised in attacks on targets well behind the enemy lines, were as yet novices in ground support.

6-12 May 1943: Following several days of incessant attacks by Allied medium and heavy bombers over north east Tunisia, the last phase of the battle began on 6 May in conditions of undisputed Allied air supremacy. Fighter-bombers and medium bombers saturated an area on the central front of no more than 5.6 by 6.4 km (3½ by 4 miles) with explosive to such good effect that when the mass Allied armour moved up to the attack it broke through the enemy defences with scarcely any opposition; indeed, the 8th Army advanced so rapidly on that first day that air support had to be withheld in the evening for fear of a repetition of the P-38

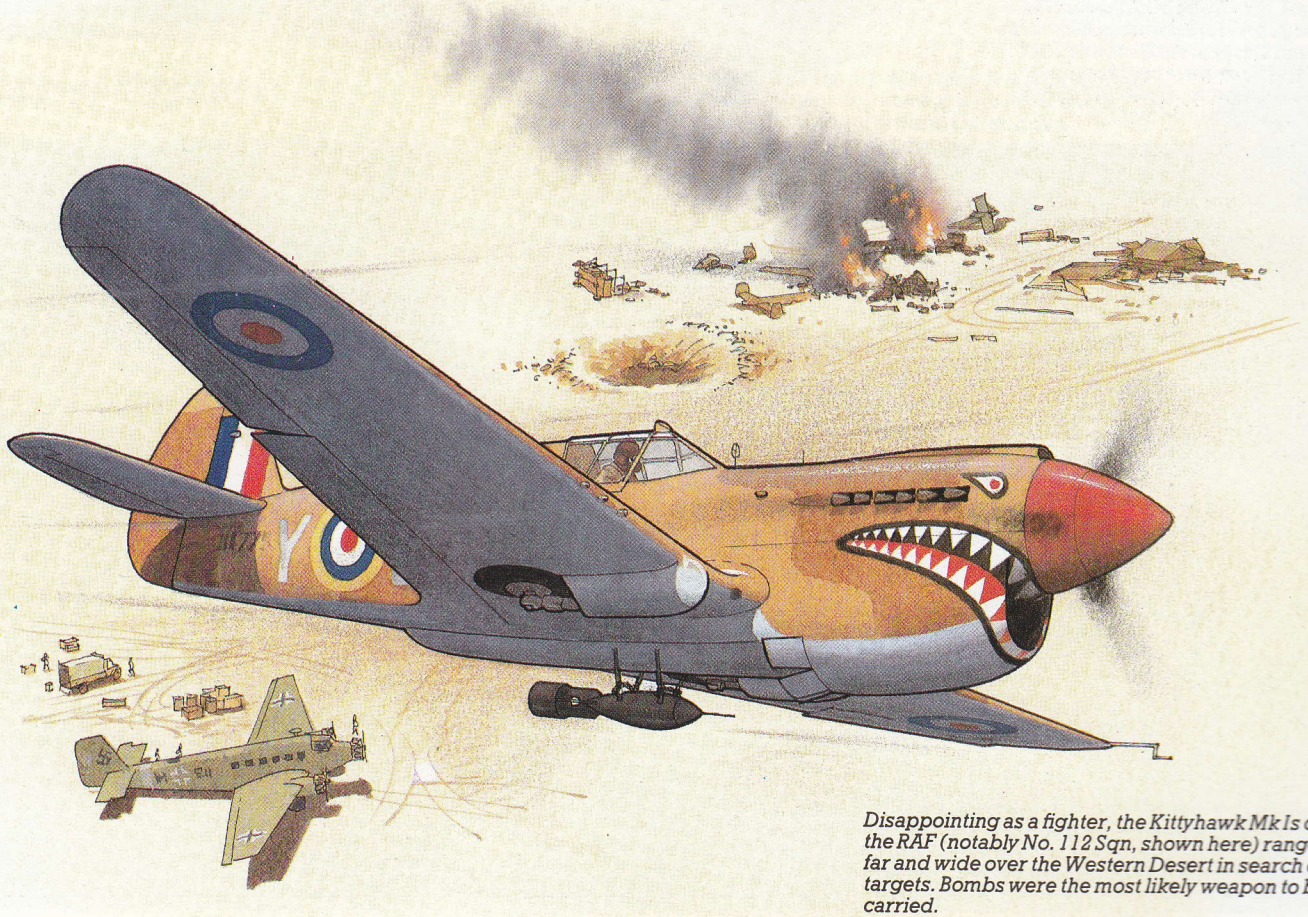
One of the more unusual tactics employed by the Allies in the desert was putting the Hurricanes of No. 213 Sqn behind the enemy lines in order to attack Axis supply lines. Using hard stretches of sand as landing strips, the Hurricanes were supported by Hudsons and armoured cars.



The map shows the pattern of the long drawn-out battles of 1941-2. British and Commonwealth air forces bore the brunt of pushing the Germans westwards, but the 'Torch' landings by the Americans completed the task.

pilots' mistake. Even so, the fighter-bombers had flown a total of 1,663 sorties in a single day. On 7 May the 8th Army was in Tunis and the Americans entered Bizerta; at this point the last remaining enemy fighters left North Africa for Sicily. During the next five days Axis resistance crumbled, with few demands by the Allied forces for further air support, the main effort by the fighter-bombers being directed at enemy airfields in Sicily, the next major objective of the desert armies and air forces.

The last great twin campaigns that merged into a single final victory in North Africa provided the Allies with a priceless rehearsal for the decisive campaigns on the continent of Europe. Close collaboration between two powerful Allies in the field was a new experience for both, and even more vitally so in the air. The bitter taste of *Blitzkrieg* had faded from the British palate, yet it was to be the only form of warfare which the Allies could employ against its architects to secure victory in Europe, and tactical air power (in the form of close-support aircraft) was to be a vital ingredient.



Disappointing as a fighter, the Kittyhawk Mk Is of the RAF (notably No. 112 Sqn, shown here) ranged far and wide over the Western Desert in search of targets. Bombs were the most likely weapon to be carried.

UK

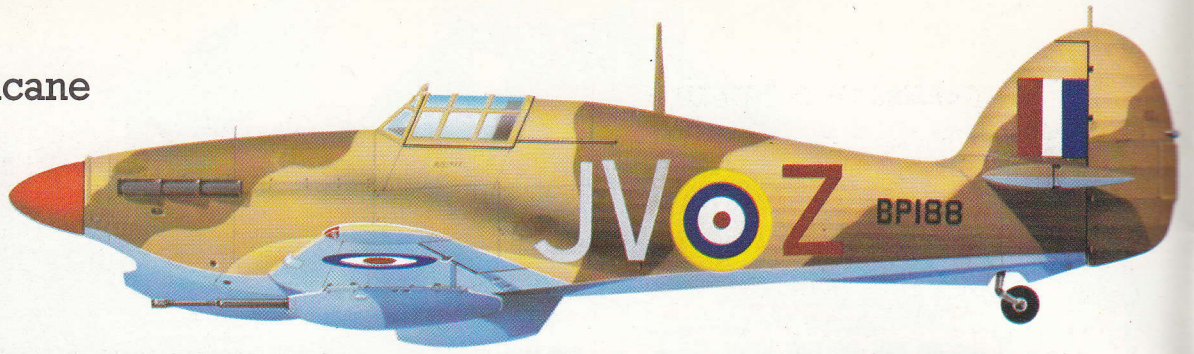
Hawker Hurricane

Rugged and combat-proven with flying colours in the Battle of Britain, the **Hawker Hurricane** was the natural choice of aircraft with which to carry the war back to the Germans when the RAF began to venture on to the offensive with cross-Channel attacks after the winter of 1940-1.

The **Hurricane Mk II,** with a more powerful Merlin XX engine, began appearing in the autumn of 1940, the **Hurricane Mk IIB** introducing a 12-gun wing, and the **Hurricane Mk IIC** an armament of four 20-mm cannon, the latter being regarded as a very heavy punch for a single-seater. Stemming from early tests to fit long-range tanks to enable Hurricanes to reinforce the Middle East with minimum refuelling stops, the Hurricane Mk IIB was soon equipped with wing racks to carry a pair of 113-kg (250-lb) or, later 227-kg (500-lb) bombs, and it was this version that went into action as the 'Hurribomber' with No. 607 Squadron on 30 October 1941 in 'Channel Stop' anti-shipping strikes, later being joined by Nos 175 and 402 Squadrons.

Hurricanes were particularly active in the ground-attack role in North Africa from mid-1941 and it was in this theatre that the next version, the **Hurricane Mk IID** tank-buster, made its first impact; armed with a pair of 40-mm Vickers anti-tank guns under the wings, aircraft of No. 6 Squadron were used to excellent effect in support of the Free French forces in the Battle of Bir Hakeim in 1942. By 1943, outclassed as a pure interceptor, the Hurricane was the RAF's first single-seater to be fitted with 76.2-mm (3-in) rocket projectiles, using these weapons on operations for the first time against the Hansweert Canal lock gates in the Netherlands on 2 September 1943.

Ground-attack Hurricanes continued to operate on the European and Mediterranean fronts until 1944; in March the previous year there had appeared a new version, the armoured **Hurricane Mk IV** in which a 'universal' wing was introduced, allowing application of bombs, anti-tank guns, rockets, smoke-laying equipment, drop tanks and other store combinations to be carried, and this version continued in service in the Far East until the end of the Pacific war. Hurricane Mk IVs fought with outstanding success in the final advance in Burma, one of their great achievements being the destruction of 13 Japanese tanks by No. 20 Squadron in a single attack during the advance on Rangoon.



The achievements of the Hurricane in the early desert war led to its being adapted to carry two 40-mm cannon under the wings for tank-busting, this version being known as the Mk IID. This example served with No. 6 Sqn in 1942.

Specification

Hawker Hurricane Mk IIB

Type: single-seat fighter-bomber

Powerplant: one 1,280-hp (955-kW) Rolls-Royce Merlin XX liquid-cooled V-12 piston engine

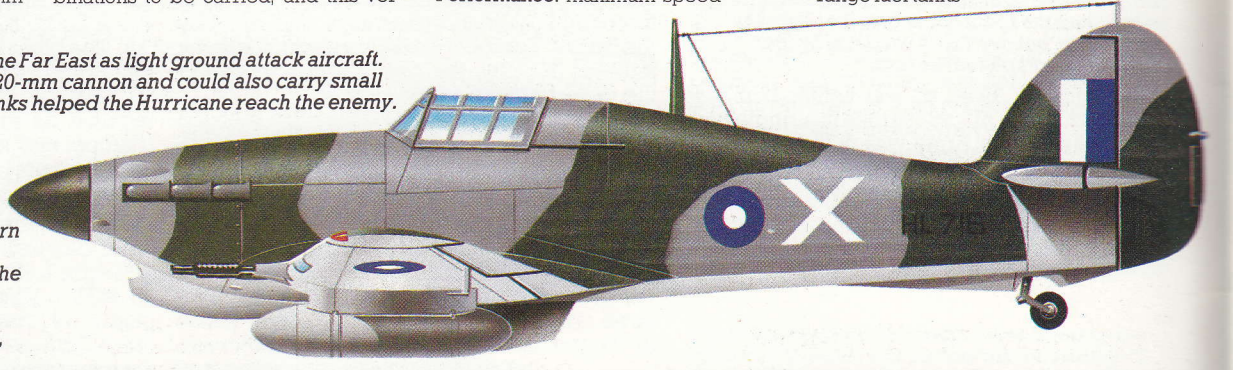
Performance: maximum speed 549 km/h (341 mph) at 6555 m (21,500 ft); climb to 6095 m (20,000 ft) in 9 minutes; service ceiling 10850 m (35,600 ft); range 740 km (460 miles)

Weights: empty 2604 kg (5,740 lb); maximum take-off 3649 kg (8,044 lb)

Dimensions: span 12.19 m (40 ft 0 in); length 9.75 m (32 ft 0 in); height 4.00 m (13 ft 1½ in); wing area 23.92 m^2 (257.5 sq ft)

Armament: 12 7.7-mm (0.303-in) machine-guns in the wings, plus an external load of up to two 227 kg (500-lb) bombs, small bomb containers, smoke-laying equipment, six 27.2-kg (60-lb) rocket projectiles or two long-range fuel tanks

Hurricane Mk IICs saw service in the Far East as light ground attack aircraft. They carried an armament of four 20-mm cannon and could also carry small bombs. As here, long range fuel tanks helped the Hurricane reach the enemy.



Below: Ready for take-off from an improvised sand strip in the Western Desert, Hurricane Mk IIDs such as these proved of enormous help to the ground forces in suppressing Axis armour. They were cumbersome, and easy meat for German fighters, so top cover was necessary.

UK

Supermarine Spitfire

No. 74 Sqn flew the Spitfire LF.Mk XVIE for only a couple of months at the end of the war on fighter-bomber sweeps through Germany. The Mk XVI had a Packard-built Merlin and could carry 113-kg (250-lb) bombs or rocket projectiles.

Immortalized as one of the greatest fighters of all time, the **Supermarine Spitfire** was also widely used as a fighter-bomber, although in this role it fell far short of the Hurricane, being tricky to fly with bombs attached, whether under fuselage or wings.

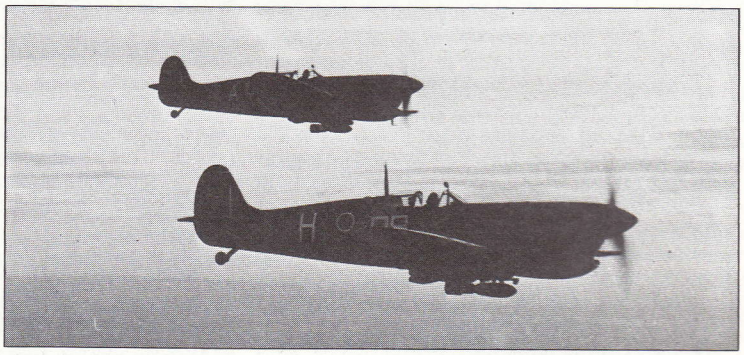
With the adoption of the **Spitfire Mk V** as Fighter Command's standard single-seat fighter in 1941, the **Spitfire Mk VC** became the fighter-bomber version, capable of carrying a single 227-kg (500-lb) bomb centrally under the fuselage or two 113 kg (250 lb) bombs under the wings. Most Spitfire Mk VCs featured clipped wings for better low-altitude performance, not being expected to engage enemy fighters above about 1525 m (5,000 ft).

Originally a hastily-introduced answer to the Focke-Wulf Fw 190A, the **Spitfire Mk IX** was intended to operate at medium and high altitudes but, like the Spitfire Mk V, was also built in clipped-wing form (**Spitfire LF.Mk IX**) and entered service with a total of 27 squadrons of the RAF in the UK, Middle East and Far East. With a 1,720-hp (1283-kW) Merlin 66, this version had a top speed without bombs of 650 km/h (404 mph) and could carry two 227-kg (500-lb) bombs under the wings; normal gun armament was two 20-mm and four 7.7-mm (0.303-in) guns, but the **Spitfire Mk IXE** sub-variant had the four rifle-calibre guns replaced by two 12.7-mm (0.5-in) guns.

Whereas the Spitfire Mk IX had been a hasty adaptation of the Spitfire Mk V to take the Merlin 61/66 series engine, the **Spitfire Mk VIII** was designed from the outset for this engine and included other refinements, including a retractable tailwheel; all were equipped for tropical service and therefore served mainly in the Mediterranean and Far East theatres, the majority of them equipping fighter-bomber squadrons.

The Griffon 65-powered **Spitfire Mk XIV** served as both a fighter and a fighter-bomber, entering service in mid-1944 in the UK. Among their outstanding achievements in the latter role was the heaviest single RAF fighter-bomber attack of the war when, on 24 December that year, 33 Spitfire Mk XIVs of Nos 229, 453 and 602 Squadrons, each carrying a 227-kg (500-lb) and two 113-kg (250-lb) bombs, attacked a V-2 rocket-launching site in the Netherlands.

Final fighter-bomber version of the Spitfire to see service during the war was the Packard Merlin 266-powered **Spitfire Mk XVI**, whose sub-variants were the same as for the Spitfire Mk IX, and could be fitted with four underwing rails for 27.2-kg (60-lb) rocket projectiles in addition to an underfuselage 227-kg (500-lb) bomb. At the end of the war in Europe fighter-bomber Spitfire Mk XVIs equipped 11 squadrons of the 2nd Tactical Air Force.



Although usually used for providing top cover for the Hurricanes in Italy, these Spitfire Mk Vs of the SAAF carry 113-kg (250-lb) bombs on the centreline rack. After releasing the bombs, the aircraft could strafe targets at will.

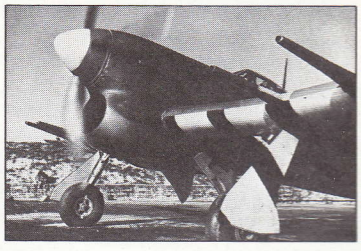
Specification

Supermarine Spitfire Mk XVI
Type: single-seat fighter-bomber
Powerplant: one 1,720-hp (1283-kW) Packard Rolls-Royce Merlin 266 liquid-cooled V-12 piston engine
Performance: maximum speed 652 km/h (405 mph) at 6705 m (22,000 ft); climb to 6095 m (20,000 ft) in 6 minutes 42 seconds: service ceiling 12650 m (41,500 ft); range without external tanks 690 km (430 miles)
Weights: empty 2547 kg (5,615 lb); maximum take-off 4311 kg (9,505 lb)
Dimensions: span, clipped 9.96 m (32 ft 8 in); length 9.55 m (31 ft 4 in); height 3.85 m (12 ft 7¾ in); wing area 21.46 m² (231 sq ft)
Armament: two 20-mm and four 7.7-mm (0.303-in) or two 12.7-mm (0.5-in) guns, plus one 227-kg (500-lb) and two 113-kg (250-lb) bombs, or as an alternative to the wing bombs four 27.2-kg (60-lb) rocket projectiles

UK

Hawker Typhoon

One of the last Typhoons to be built with the car-type door, this aircraft from No. 198 Sqn is seen before the application of invasion stripes in early 1944. The squadron at the time was learning to use the new rocket projectiles.



Close-up of the business end of a Typhoon Mk IB, showing the four Hispano cannon.

Compromised from the outset by a host of design and development difficulties, and no less by a disastrously accelerated engine development that left unsolved numerous weaknesses when it entered service, the **Hawker Typhoon** was intended to replace the Hurricane as an interceptor. However, after the anti-climactic debacle over Dieppe and its singularly disappointing performance as an interceptor, the Typhoon came to be recognized as potentially an effective ground-attack fighter and, following trials at Boscombe Down in 1942, it resumed cross-Channel operations carrying a pair of 113-kg (250-lb) bombs to supplement its four 20-mm Hispano cannon armament. Flying alongside the aged 'Hurribombers', **Typhoon Mk IB** fighter-bombers of Nos 175, 181 and 245 Squadrons continued the 'Channel Stop' operations throughout 1943, while others ventured over enemy-occupied France and the Low Countries, attacking airfields, road and rail traffic and other key targets.

Early operations had shown the **Typhoon Mk IA**, with its wing armament of 12 7.7-mm (0.303-in) Browning machine-guns, to be relatively ineffective in the ground-attack role, and this version was discontinued. Another weakness was found to lie in the joint of the tail unit to the rear fuselage, numerous early accidents being ascribed to the entire tail unit becoming detached in flight, for which a crude remedy was effected by simply riveting numerous plates around the joint. An early operational problem lay in the Typhoon's superficial resemblance to the Focke-Wulf Fw 190, resulting in a number of aircraft being shot down by 'friendly' guns, until prominent black and white recognition stripes were painted under the Typhoon's inner wing sections.

For all these unfortunate tribulations the chunky aeroplane emerged in 1944 as one of the most powerful weapons in the Allies' armoury when the Normandy invasion was launched in June that year. With a bombload progressively increased to 907 kg (2,000 lb), the Typhoon was also used with devastating effect as a rocket-firing fighter, eliminating vital enemy coastal radar stations before the landings themselves and destroying German armoured concentrations as the Allies broke out of the beach-head. Always something of a handful to fly, the Typhoon nevertheless provided an overwhelming form of powerful, accurate and mobile artillery for the Allies as they surged through northern Europe in the last nine months of the war.

Specification

Hawker Typhoon Mk IB
Type: single-seat fighter-bomber
Powerplant: one 2,180-hp (1626-kW) Napier Sabre II liquid-cooled H-24 piston engine
Performance: maximum speed 652 km/h (405 mph) at 5485 m (18,000 ft); climb to 4570 m (15,000 ft) in 6 minutes 12 seconds; service ceiling 10365 m (34,000 ft); range with bombs 820 km (510 miles)
Weights: empty 3993 kg (8,800 lb); maximum take-off 6341 kg (13,980 lb)
Dimensions: span 12.67 m (41 ft 7 in); length 9.73 m (31 ft 11 in); height 4.66 m (15 ft 3½ in); wing area 25.92 m² (279 sq ft)
Armament: four wing-mounted 20-mm cannon, plus either two 454-kg (1,000-lb) bombs or eight 27.2-kg (60-lb) rocket projectiles

Hawker Typhoon in Action

Despite enormous development problems, the Hawker Typhoon eventually proved itself as the premier RAF fighter-bomber of the war, able to absorb massive battle damage and having the speed to get out of any trouble from enemy fighters, especially at low level. Carrying rockets or bombs, ably assisted by four cannon, the Typhoon could pack a heavy punch and was instrumental in paving the way for the Allied advance across Europe.

If the Hawker Typhoon had been intended to equip the Royal Air Force in peacetime there is no doubt that it would have joined the depressingly long list of project casualties. Put quite simply, it would have been abandoned part of the way through its flight trials, such were the apparently insurmountable problems encountered. It had been conceived in parallel with the Hawker Tornado back in 1937 as an eventual replacement for the Hawker Hurricane, then yet to arrive in service with Fighter Command. Both new fighters were to be powered by radical engines, the Typhoon by the 24-cylinder Napier Sabre and the Tornado by the 24-cylinder Rolls-Royce Vulture, neither of which had seen the light of day. (The Vulture survived to see operational service in the Avro Manchester bomber before being abandoned as unreliable, and the Tornado inevitably also fell by the wayside.)

Sydney Camm was urged to push ahead with his Typhoon, being promised that Sabre engines would be ready for prototypes in 1940; unfortunately the prototype Typhoon suffered a serious structural failure during an early test flight and was only saved from destruction by the brilliant airmanship of test pilot Philip Lucas, who was awarded the George Medal for his courage and skill.

Production Typhoons started appearing in 1941 amid rumours that the engine was giving so much trouble that the whole programme was in danger of cancellation. Two versions were produced side-by-side, the Typhoon Mk IA with 12 Browning machine-guns and the Typhoon Mk IB with four 20-mm Hispano cannon, but the former was soon abandoned when it was realised that rifle-calibre guns were no longer effective against the armour which by 1941 was fitted in almost all German aircraft.

During the winter of 1941-2 Typhoons were crashing all over the UK, all manner of causes being diagnosed, including seepage into the cockpit of carbon monoxide, engine crankshaft failure, overheating during take-off leading to seizure, and breakdown of engine lubrication. Three well-known test pilots (among them the great P.E.G. Sayer) were lost in Typhoon accidents. Then a new spectre arose: Typhoons were being lost in alarming numbers following breakaway of the entire tail unit at the rear transport joint.

Focke-Wulf rival

However, despite a fairly powerful lobby in the Air Ministry which favoured dropping the Typhoon altogether, the appearance of the Focke-Wulf Fw 190 over the Channel encouraged an all-out effort to overcome the British fighter's shortcomings, for the new enemy fighter was proving superior to Fighter Command's Supermarine Spitfire Mk V, and no replacement was in sight other than the hurriedly proposed Spitfire Mk IX.

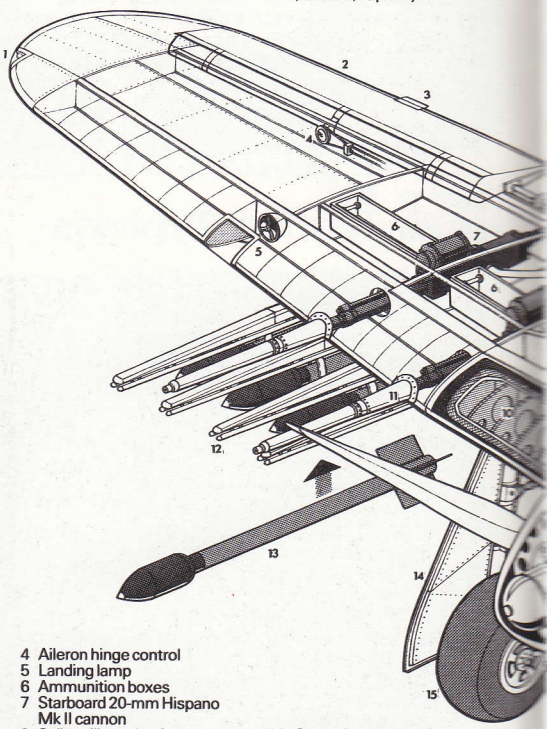
The Typhoon's showdown with the Fw 190 was intended to be staged over the Dieppe landings, scheduled for the summer of 1942 when it was hoped to have several wings of Typhoons and Spitfire Mk IXs. Despite postponement of the operation, few of the new Spitfires were fully operational and even fewer Typhoons were combat-ready (with No. 56 Squadron) when the landings were carried out on 19 August, and the new fighters were so ineffectively committed to battle that almost their only test was between Typhoon and Spitfire Mk IX. Two Typhoons were lost when their tail units broke away in dives. As it was, the Focke-Wulfs had a field day among the Spitfire Mk Vs.

Although Fighter Command went ahead with introducing Typhoons into service, the aircraft was heavily restricted in g-loading, power setting and altitude. Nevertheless No. 609 Squadron, under the command of Squadron Leader R.P. Beamont, operated with some success from Manston against the tip-and-run depredations of the Fw 190s over southern England in the autumn of 1942.

It was the success now achieved by the Typhoon against these low-level raiders that focussed attention on its excellent performance below about 3050 m (10,000 ft). Almost immediately racks were fitted under the wings capable of mounting a pair of 113-kg (250-lb) bombs, and before the year was out Typhoons were being flown against enemy shipping off the French coast. With the arrival in service of the first Griffon-powered Spitfire Mk XIIs (developed specifically to deal with the Fw 190 sneak raiders) the Typhoon was almost exclusively switched to the ground-attack role. With most of the engine problems now largely cured and a string of fish plates riveted round the rear transport fuselage joint, production (by now transferred to the Gloster Aircraft Company)

A scene repeated at many RAF bases across southern England and France during the last years of the war; armourers prepare to load 454-kg (1,000-lb) bombs on to the underwing shackles of a No. 175 Sqn Typhoon, as the pilot waits to board his aircraft.

Hawker Typhoon Mk IB cutaway drawing key



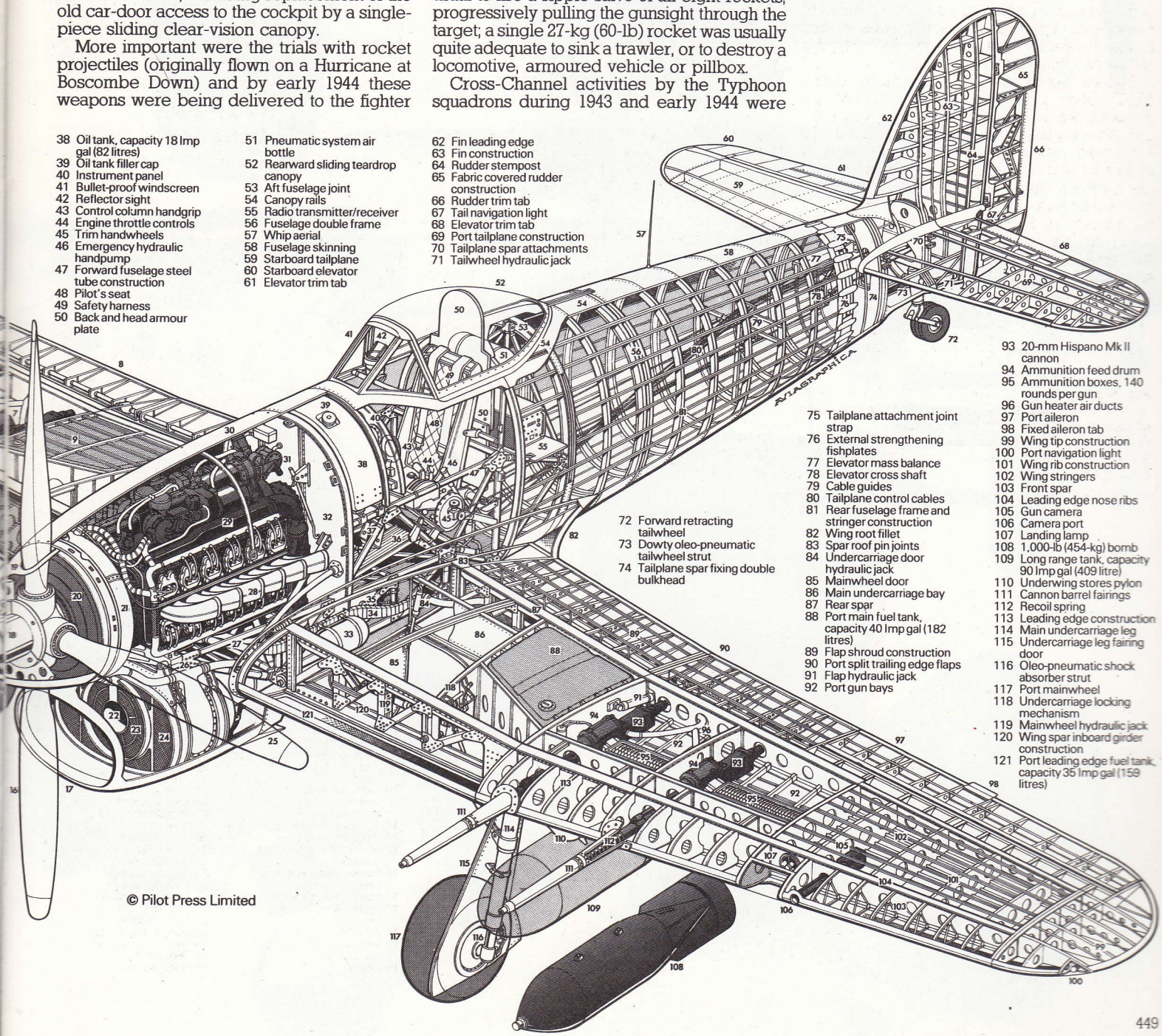
1 Starboard navigation light
2 Starboard aileron
3 Fixed trim tab
4 Aileron hinge control
5 Landing lamp
6 Ammunition boxes
7 Starboard 20-mm Hispano Mk II cannon
8 Split trailing edge flaps
9 Starboard main fuel tank, capacity 40 Imp gal (182 litres)
10 Self-sealing leading edge fuel tank, capacity 35 Imp gal (159 litres)
11 Cannon barrel fairings
12 Rocket launcher rails
13 60-lb (27-kg) ground attack rockets
14 Main undercarriage leg fairing
15 Starboard mainwheel
16 De Havilland four-bladed propeller
17 Air intake
18 Propeller pitch change mechanism
19 Spinner
20 Armoured spinner backplate
21 Coolant tank, 7¼ Imp gal (33 litres) capacity
22 Supercharger ram air intake
23 Oil radiator
24 Coolant radiator
25 Radiator shutter
26 Engine mounting block
27 Tubular steel engine support framework
28 Exhaust stubs
29 Napier Sabre II, 24-cylinder flat H engine
30 Engine cowlings
31 Cartridge starter
32 Engine compartment fireproof bulkhead
33 Oxygen bottle
34 Gun heating air duct
35 Hydraulic reservoir
36 Footguards
37 Rudder pedals

As the Allies advanced through France and Germany, the Typhoon bases went with the troops. This Typhoon on the strength of No. 175 Sqn was stationed at Celle, an old Luftwaffe base, during the closing days of the war.

was accelerated. By the end of 1942 11 squadrons (Nos 1, 56, 181, 182, 183, 195, 197, 198, 257, 266 and 609) were flying Typhoon Mk IBs, and to these were added Nos 3, 174, 175, 184, 186, 193, 245, 247 and 263 Squadrons in 1943. Following trials at Boscombe Down, heavier bombs were carried, in the form first of 227-kg (500-lb) and then 454-kg (1,000-lb) weapons. A modification to the fuel system was made enabling drop tanks to be carried in place of the bomb load, and improvements were made throughout the airframe, including replacement of the old car-door access to the cockpit by a single-piece sliding clear-vision canopy.

More important were the trials with rocket projectiles (originally flown on a Hurricane at Boscombe Down) and by early 1944 these weapons were being delivered to the fighter bases on the South Coast as modifications were made to accommodate the four launching rails under each wing. The 76.2-mm (3-in) rocket with 27-kg (60-lb) warhead was a relatively primitive weapon, being little more than an iron pipe containing the solid propellant, with the warhead screwed on the front and cruciform rectangular fins attached to the rear. As a result of the considerable gravity drop on launch the rockets were difficult to aim accurately except in a very steep dive, and it was usual to fire a ripple salvo of all eight rockets, progressively pulling the gunsight through the target; a single 27-kg (60-lb) rocket was usually quite adequate to sink a trawler, or to destroy a locomotive, armoured vehicle or pillbox.

Cross-Channel activities by the Typhoon squadrons during 1943 and early 1944 were such as to earn the rugged fighter a reputation as a devastating weapon second to none. It was still a tricky beast to handle, with many an idiosyncrasy to trap the unwary. Exhaust blowback during starting caused several fires on the ground but, provided the groundcrews were on their toes, these were seldom serious. Take-off and landing were marked by a partiality to swing powerfully to one side (for much the same reasons as on the Sopwith Camel of a quarter century earlier), only its characteristically rugged, wide-track landing gear enabling the Typhoon to operate from relatively uneven runways.



38 Oil tank, capacity 18 Imp gal (82 litres)
39 Oil tank filler cap
40 Instrument panel
41 Bullet-proof windscreen
42 Reflector sight
43 Control column handgrip
44 Engine throttle controls
45 Trim handwheels
46 Emergency hydraulic handpump
47 Forward fuselage steel tube construction
48 Pilot's seat
49 Safety harness
50 Back and head armour plate
51 Pneumatic system air bottle
52 Rearward sliding teardrop canopy
53 Aft fuselage joint
54 Canopy rails
55 Radio transmitter/receiver
56 Fuselage double frame
57 Whip aerial
58 Fuselage skinning
59 Starboard tailplane
60 Starboard elevator
61 Elevator trim tab
62 Fin leading edge
63 Fin construction
64 Rudder stempost
65 Fabric covered rudder construction
66 Rudder trim tab
67 Tail navigation light
68 Elevator trim tab
69 Port tailplane construction
70 Tailplane spar attachments
71 Tailwheel hydraulic jack
72 Forward retracting tailwheel
73 Dowty oleo-pneumatic tailwheel strut
74 Tailplane spar fixing double bulkhead
75 Tailplane attachment joint strap
76 External strengthening fishplates
77 Elevator mass balance
78 Elevator cross shaft
79 Cable guides
80 Tailplane control cables
81 Rear fuselage frame and stringer construction
82 Wing root fillet
83 Spar roof pin joints
84 Undercarriage door hydraulic jack
85 Mainwheel door
86 Main undercarriage bay
87 Rear spar
88 Port main fuel tank, capacity 40 Imp gal (182 litres)
89 Flap shroud construction
90 Port split trailing edge flaps
91 Flap hydraulic jack
92 Port gun bays
93 20-mm Hispano Mk II cannon
94 Ammunition feed drum
95 Ammunition boxes, 140 rounds per gun
96 Gun heater air ducts
97 Port aileron
98 Fixed aileron tab
99 Wing tip construction
100 Port navigation light
101 Wing rib construction
102 Wing stringers
103 Front spar
104 Leading edge nose ribs
105 Gun camera
106 Camera port
107 Landing lamp
108 1,000-lb (454-kg) bomb
109 Long range tank, capacity 90 Imp gal (409 litre)
110 Underwing stores pylon
111 Cannon barrel fairings
112 Recoil spring
113 Leading edge construction
114 Main undercarriage leg
115 Undercarriage leg fairing door
116 Oleo-pneumatic shock absorber strut
117 Port mainwheel
118 Undercarriage locking mechanism
119 Mainwheel hydraulic jack
120 Wing spar inboard girder construction
121 Port leading edge fuel tank, capacity 35 Imp gal (159 litres)

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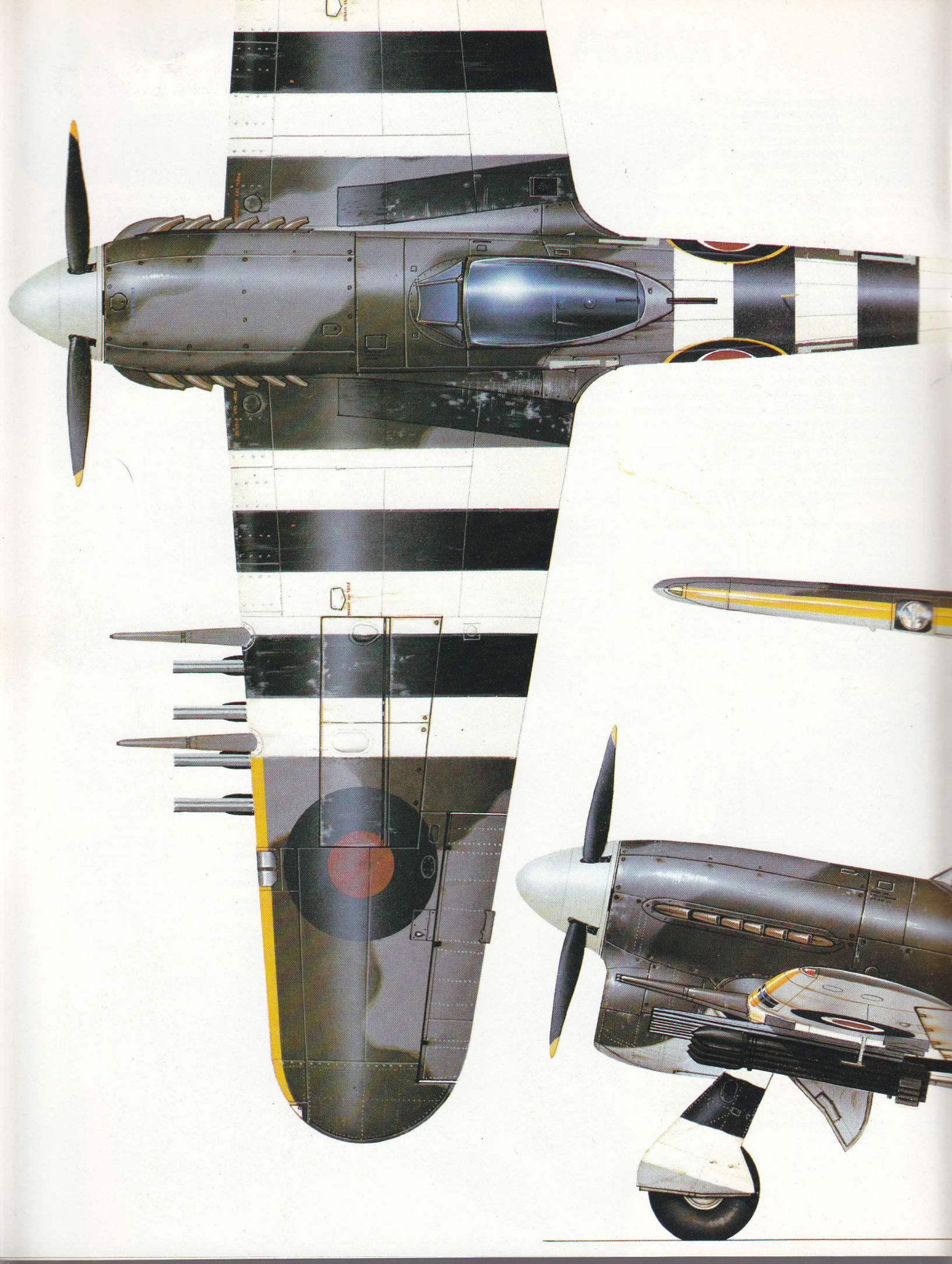
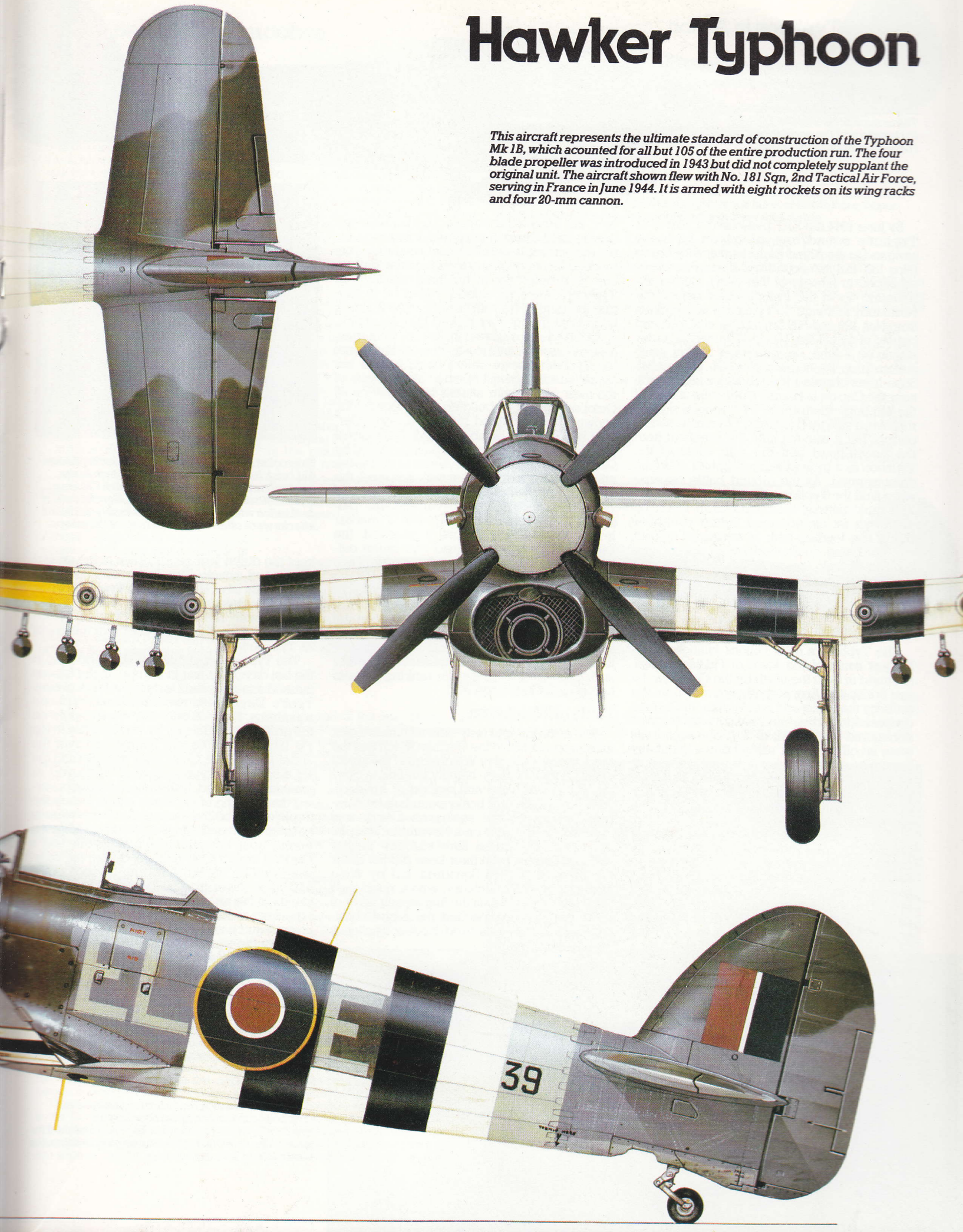


Hawker Typhoon

This aircraft represents the ultimate standard of construction of the Typhoon Mk 1B, which acounted for all but 105 of the entire production run. The four blade propeller was introduced in 1943 but did not completely supplant the original unit. The aircraft shown flew with No. 181 Sqn, 2nd Tactical Air Force, serving in France in June 1944. It is armed with eight rockets on its wing racks and four 20-mm cannon.



Hawker Typhoon in Action

RB389 was in service with No. 440 Sqn RCAF, based at Goch in 1945, by which time the aircraft was beginning to look rather war-weary. The armament is two 454-kg (1,000-lb) bombs and the normal four Hispano cannon in the wings.

By June 1944 the RAF possessed a total of 22 Typhoon squadrons, of which 18 were assigned to the Allied Expeditionary Air Force (Nos 137 and 164 Squadrons having been re-equipped in January of that year). During the softening up of the French coast before the Normandy landings, 18 Typhoons with rockets from Nos 198 and 609 Squadrons attacked and put out of action the Dieppe/Caudecôte radar station on 2 June; on the eve of D-Day itself, rocket-firing Typhoons of Nos 174, 175 and 245 Squadrons crippled the Jobourg radar station near the Cap de la Hague. During the course of the landings themselves 14 Typhoon squadrons were assigned to 'armed reconnaissance' patrols, but it was not until the breakout from the beach-head that the true value of the Typhoon as a ground-support fighter was fully demonstrated. As the ground battle became more fluid the Typhoon pilots began operating 'cab rank' patrols, their leaders in touch by VHF with an experienced fighter controller riding in a leading tank or armoured contact car. On being confronted by an enemy gun position or tank, the controller would identify the target and call down the Typhoons patrolling overhead to make a gun, bomb or rocket attack.

The Falaise pocket

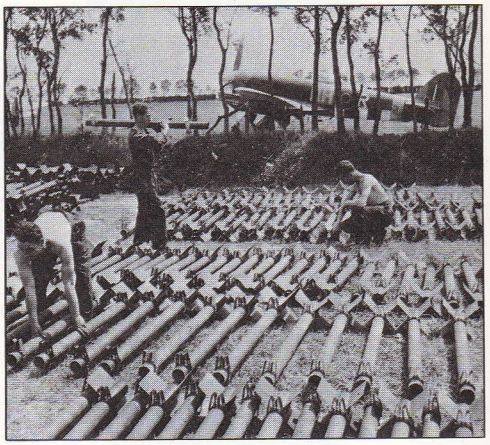
The Typhoon's most famous killing ground lay just south of the town of Falaise where, hemmed in from the north by the Canadian 1st and British 2nd Armies, and encircled from the south by the US 1st and 3rd Armies, 16 German divisions (including nine Panzer) lay trapped during mid-August. All 18 Typhoon squadrons were let off the leash, using bombs to cut any remaining escape routes, firing salvo after salvo of rockets at the armoured vehicles as they jammed the roads and lanes, and then cannon fire at the German soldiers as they sought what cover they could.

The reduction of the Falaise pocket merely enabled the Allied advance through France to accelerate temporarily, and by the end of September almost all of northern France had been overrun. A major part of the Allied Tactical Air Force had moved to bases on the Continent, the Typhoons operating from a succession of dusty airfields and strips close up behind the advancing armies. To bombard the enemy-held Channel ports into submission, after the armies had rolled past, recourse was made to heavy bombers to reduce the 'fortresses' to rubble, yet in the final assaults the Typhoons were repeatedly called on to subdue the defenders with salvoes of well-aimed rockets as the infantry moved into the attack.

As the advance slowed in the Low Countries, and in the south came to a halt before the Rhine, the Typhoons were called on to launch 'set piece' attacks against specific targets, one of the most spectacular attacks being that on 24 October against a building near Dordrecht, known to be occupied by high-ranking German staff officers. Bomb-carrying Typhoons of Nos 193, 197, 257, 263 and 266 Squadrons led by Group Captain D.E. Gillam, were sent into the attack in three formations at very low level, the centre group with 227- and 454-kg (500- and 1,000-lb) bombs following Gillam, who pinpointed the target building with a marker bomb. Immediately before it attacked, the flank formations drew ahead and broke outwards to attract and confuse the enemy Flak. Within seconds of Gillam's marker bursting four 454-kg (1,000-lb) bombs, launched from a height of about 6 m (20 ft), had struck and reduced the building to rubble, whereupon the remaining Typhoons returned to add their bombs to complete the devastation. It was later learned that two German generals, 17 other staff officers and 55 middle-ranking officers had been killed in the raid.

Battle of Walcheren

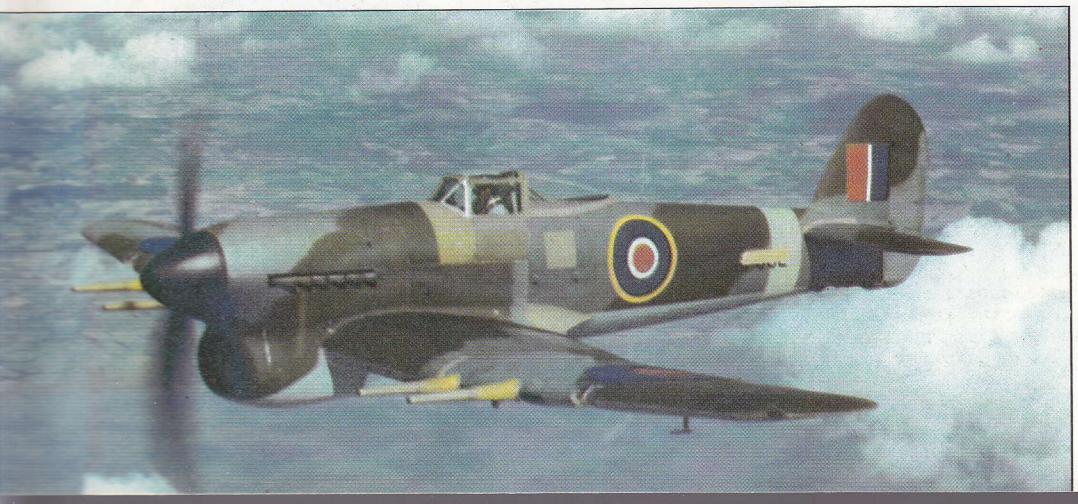
One of the last and most difficult nuts to crack in the approaches to the German Reich was the great fortress island of Walcheren at the mouth of the Scheldt estuary, heavily fortified to deny the Allies use of the vital seaport of Antwerp. After several days of heavy pounding by Bomber Command, the seaborne attack was ordered for first light on 1 November, despite low cloud and almost zero visibility. Similar weather conditions at their base did not deter the pilots of No. 183 Squadron, led by Wing Commander R.W. Mulliner, who arrived over the landing craft just as the first assault wave of Royal Marines approached the island coastline, and the rockets fired by the Typhoons kept the defenders' heads down at the critical moment of attack. The Battle of Walcheren lasted eight days, during which Typhoons of six squadrons were constantly in action: 11,637 rockets were fired and 1,558 tons of bombs dropped by the fighter-bombers, for the loss of 22 Typhoons.



The rocket stores of a forward base for Typhoons did brisk business from D-Day onwards as the squadrons flew daily missions to catch German communications and supply lines. Careful co-ordination with the army was necessary as the air attacks were often only just in front of the troops.

The Typhoon continued in action right up to the last day of the war in Europe. In the famous massed attack by the German air force of New Year's Day, 1945, two Canadian Typhoon squadrons, Nos 438 and 439, were caught on the ground at Eindhoven by waves of low flying Fw 190s and Bf 109s which appeared over the airfield just as the Canadians were taxiing out for a sortie: 16 Typhoons were destroyed or seriously damaged. In the air operations covering the crossing of the Rhine late in March the Typhoons of the 2nd Tactical Air Force were in constant demand, on 21 March striking an enemy troop concentration near Zwolle and a German army HQ at Bussum; during the crossing itself by the 6th Airborne Division on 23 March no fewer than 60 Typhoons were constantly in the air over the landing zones, while others set about the destruction of enemy anti-aircraft gun positions nearby.

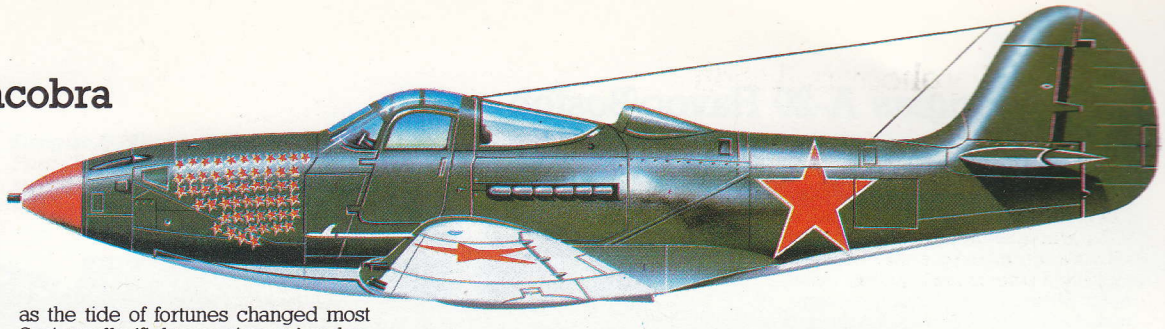
When the war ended the Allied armies had smashed their way across 1125 km (700 miles) of bitterly contested territory, ironically employing tactics not materially different from the German *Blitzkrieg* warfare so widely deplored by a pacifist world five long years earlier. Just as the Stukas had spearheaded the Panzer advance westwards in 1940 so the Typhoons cleared the eastward path for the Sherman tanks in 1945.



The 24-cylinder Napier Sabre engine gave the Typhoon a massive appearance, and its performance and strength at low level matched its looks. The cannon armament, coupled with bombs and rockets, was devastating.

USA

Bell P-39 Airacobra



The Bell P-39L Airacobra was a failure as an air combat fighter (apart from notable exceptions such as the aircraft shown here, of the Russian, Major Pokryshkin) and was used mainly in the ground attack role.

The radical **Bell P-39 Airacobra**, with midships engine and tricycle landing gear, enjoyed a disappointing career as a fighter with the American and British air forces as a result mainly of the abandonment of the turbosupercharger which had promised to bestow excellent performance at high altitude; this equipment was in any case banned from export to the UK, with the result that the Airacobra did not match up to RAF requirements for an interceptor. The upshot of this was a gradual change to the ground-attack role in American service, and disposal of very large numbers to the Soviet Union from 1942 onwards, 4,773 of the 9,558 built being supplied to that nation, mainly through Iran, but also over the Trans-Siberian railway. More than 200 Bell Airacobras were also shipped to the USSR in the North Cape convoys.

P-39s entered service with the V-VS early in 1943, the principal variant being the **P-39N** which featured a hub-firing 37-mm cannon, two nose-mounted 12.7-mm (0.5-in) and four wing-mounted 7.62-mm (0.3-in) machine-guns; a single 227-kg (500-lb) bomb could be carried under the fuselage.

In Soviet service the P-39 was used initially as a pure fighter, but gradually as the tide of fortunes changed most Soviet *polks* (fighter regiments) undertook a dual role in response to the demands of the massive ground battles that raged on the Eastern Front. Often the P-39s would be called on to carry out specific bombing tasks, after which they would revert to fighters to provide cover while subsequent bombing attacks went in. The majority of P-39 *polks* were deployed on the central and southern fronts, and numerous Soviet pilots achieved considerable success in the aircraft; Captain Grigori Rechkalov scored 44 of his 58 air victories in a P-39 with the 9th Guards Fighter Division, and Aleksandr Pokryshkin, who commanded a P-39 *eskadril* in the 216th Guards Fighter Division's 16th Polk and later became the Soviet Union's second highest scoring pilot, shot down 48 of his 59 victims while flying P-39s, many of these falling in the course of dual-role fighter/bombing missions. For all the P-39's obvious success on the Eastern Front, wastage through accidents was by all accounts very high, relatively inexperienced pilots finding the aircraft tricky to handle and, with the big Allison engine located behind the cockpit, forced landings and other landing mishaps were frequently fatal. A much smaller number of the later but related **Bell P-63 Kingcobra** was also supplied to the Soviet Union, this aircraft being equipped to carry three 227-kg (500-lb) bombs.

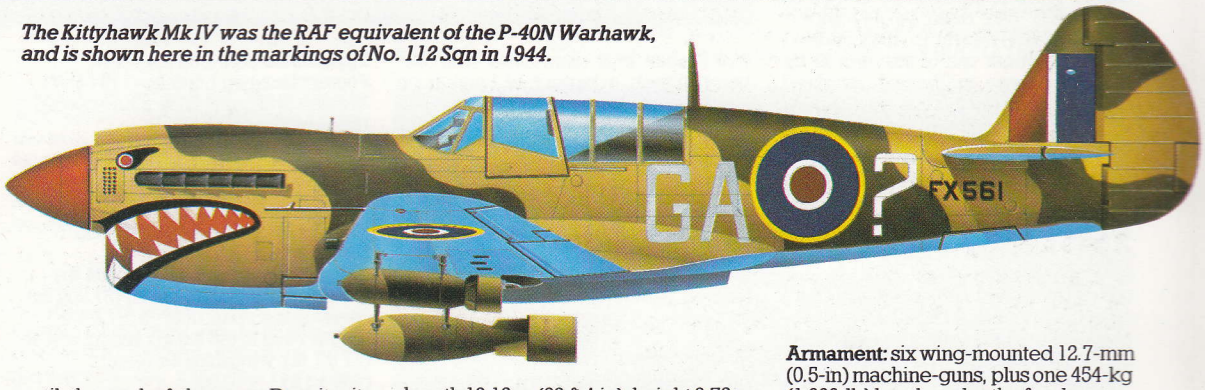
Specification

Bell P-39N Airacobra
Type: single-seat fighter-bomber
Powerplant: one 1,200-hp (895-kW) Allison V-1710-85 liquid-cooled V-12 piston engine
Performance: maximum speed 642 km/h (399 mph) at 3355 m (11,000 ft); climb to 4570 m (15,000 ft) in 5 minutes 20 seconds; service ceiling 11735 m (38,500 ft); range 1205 km (750 miles)
Weights: empty 2562 kg (5,645 lb); maximum take-off 3720 kg (8,200 lb)
Dimensions: span 10.36 m (34 ft 0 in); length 9.19 m (30 ft 2 in); height 3.78 m (12 ft 5 in); wing area 19.79 m² (213 sq ft)
Armament: one hub-firing 37-mm cannon, two nose-mounted 12.7-mm (0.5-in) and four wing-mounted 7.62-mm (0.3-in) machine-guns, plus a single 227-kg (500-lb) bomb carried under the fuselage

USA

Curtiss P-40

The Kittyhawk Mk IV was the RAF equivalent of the P-40N Warhawk, and is shown here in the markings of No. 112 Sqn in 1944.



Although firmly rooted among the first generation of monoplane fighters of the late 1930s, the famous **Curtiss P-40** family underwent progressive modernization, and as each version became outmoded by later fighters, it came to be employed as a passable fighter-bomber. Adopted as the USAAC's standard fighter and subject of heavy British purchasing in 1940, the early **P-40B, P-40C** and **Tomahawk** entered service in 1941, the first RAF squadron to receive the latter being No. 112 in the Middle East. The Tomahawk's performance as an interceptor was disappointing, being generally inferior to the Hurricane Mk II, and it was therefore employed mainly for ground attack, although the armament of six rifle-calibre machine-guns was far from adequate. Tomahawks (and the equivalent P-40B/Cs) were shipped to the USSR and Turkey, and were flown by American pilots in the Pacific and South East Asia. The **P-40D** represented something of a transformation, with the Allison engine installed in a shortened nose, fuselage guns removed and the radiator moved forward. Known as the **Warhawk** in American service (as were all P-40s) and **Kittyhawk** in RAF service, this and subsequent similar versions were built in very large numbers up to 1944, from mid-1942 being equipped as fighter-bombers in the USAAF, RAF and other Allied air forces to carry up to three 227-kg (500-lb) bombs under fuselage and wings; later versions could carry a 454-kg (1,000-lb) bomb under the fuselage. They were particularly active in the close-support role in North Africa after the victory at Alamein and the 'Torch' landings, and in the campaigns in Sicily, Italy and the Balkans.

The Packard built Merlin was used in the American **P-40F** and **P-40L** versions, but the **P-40N** (of which 5,219 were produced) reverted to the Allison engine and this served from 1943 until the end of the war. Despite its widespread use as a fighter-bomber the P-40 was not generally appreciated as a result of its control sluggishness and lateral trim changes as speed built up in a diving attack; the latter behaviour, which gave rise to excessive yawing at the moment of bomb release, made accurate bombing extremely difficult, and P-40s were more usually employed for attacks on larger rather than smaller targets.

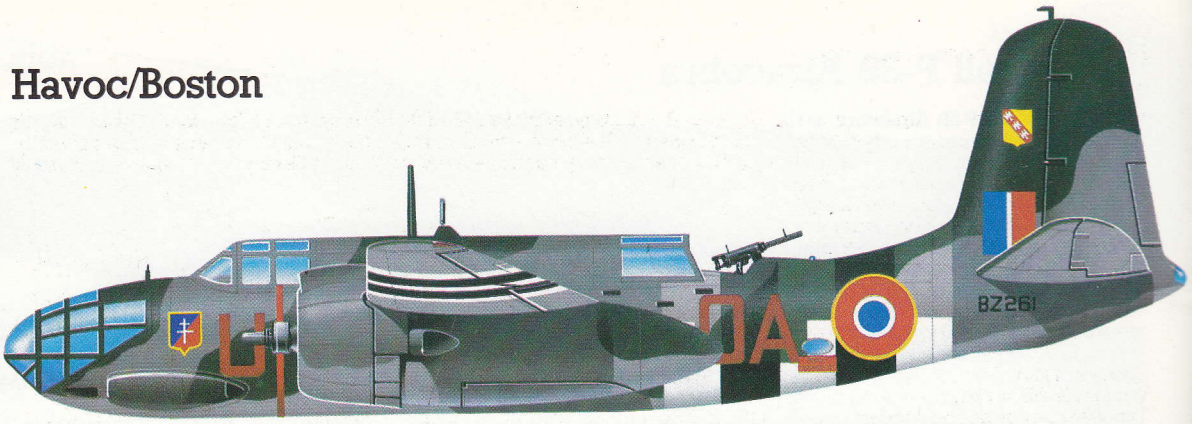
Specification

Curtiss P-40N Warhawk
Type: single-seat fighter-bomber
Powerplant: one 1,360-hp (1015-kW) Allison V-1710-81 liquid-cooled V-12 piston engine
Performance: maximum speed 609 km/h (378 mph) at 3200 m (10,500 ft); climb to 4570 m (15,000 ft) in 6 minutes 49 seconds; service ceiling 11580 m (38,000 ft); range on internal fuel 547 km (340 miles)
Weights: empty 2722 kg (6,000 lb); maximum take-off 5171 kg (11,400 lb)
Dimensions: span 11.38 m (37 ft 4 in); length 10.16 m (33 ft 4 in); height 3.76 m (12 ft 4 in); wing area 21.92 m² (236 sq ft)
Armament: six wing-mounted 12.7-mm (0.5-in) machine-guns, plus one 454-kg (1,000-lb) bomb under the fuselage and two 227-kg (500-lb) bombs under the wings

Bearing the famous shark's teeth markings of No. 112 Sqn, these Tomahawks are ready for take-off at Sidi Haneish in the autumn of 1941. The difference in nose shape to the later Kittyhawk is obvious, with the chin radiator being much smaller.

USA

Douglas A-20 Havoc/Boston



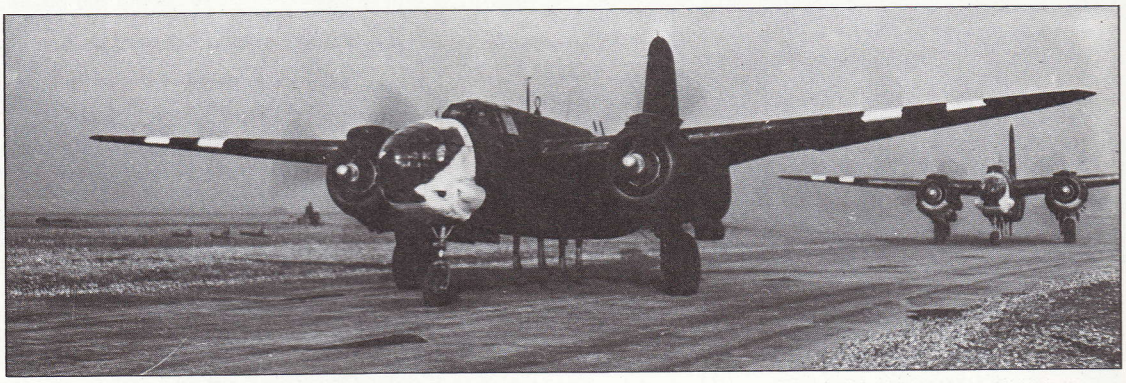
Douglas Boston Mk IIIA of No. 342 Sqn 'Lorraine', RAF, based at Hartford Bridge (today called Blackbushe). Aircraft from this squadron were the first French-flown aircraft to arrive back in France after D-Day.

Perpetuating a misconception of the nature of modern warfare during the late 1930s, the American 'attack' bomber was envisaged as a means of saturating fixed enemy defences in the immediate area of the ground battle, and took little account of the swift movement of armies so capably demonstrated during the German conquests of 1939-41. Moreover the **Douglas A-20**, known as the **Havoc** and **Boston** by American and British air forces respectively, was so unwieldy that it could only be employed over a battleground in the face of enemy air opposition provided it was furnished with strong fighter escort.

Nevertheless production momentum already gained by British and French orders at the beginning of the war resulted in the A-20 being available in quickly growing numbers when the United States entered the conflict. And, despite fairly heavy losses early on, the type eventually came to play an important tactical role, being used first as a 'light-medium' bomber for attacks on fixed battlefield targets, such as forward enemy landing grounds, road, rail and river bridges and vehicle parks, etc.

The RAF was the first to use the aircraft, as the Boston (after a night-fighter version, confusingly known as the Havoc, had been largely superseded in 1941) early in 1942; indeed the first combat use of the aircraft by the Americans in Europe involved RAF Bostons being flown from the UK by an American squadron in July that year.

From late in 1942 both the British and American air forces flew the Boston and A-20 on close-support duties, particularly on 'softening up' raids before assaults by ground forces. RAF Bostons in particular were much in evidence during the numerous combined operations launched across the Channel in 1942-4, and were also used to lay smoke screens to cover amphibious landings. The **A-20G** introduced a 'solid' nose and dispensed with the bomb aimer, a battery of cannon or machine-guns being substituted for true ground-attack work. In the Pacific theatre A-20s were widely used for low-level attack, using fragmentation bombs to good effect over Japanese shipping and airfields. RAF **Boston Mk IV** and **Boston Mk V** aircraft served with the 2nd Tactical Air Force and the Desert Air Force in Italy in the close-support role right up to the end of the war against Germany.



One of the tasks for the airborne forces during the D-Day invasion was smoke-laying. These two Boston Mk IIIs are equipped with four pipes under the fuselage for providing smoke over the beach-head.

Specification
Douglas A-20G Havoc

Type: three-seat attack aircraft
Powerplant: two 1,600-hp (1194-kW) Wright Cyclone R-2600-23 air-cooled radial piston engines
Performance: maximum speed 546 km/h (339 mph) at 3780 m (12,400 ft); climb to 3050 m (10,000 ft) in 7 minutes 6 seconds; service ceiling 7650 m (25,100 ft); range 1755 km (1,090 miles)
Weights: empty 7250 kg (15,984 lb); maximum take-off 12338 kg (27,200 lb)
Dimensions: span 18.69 m (61 ft 4 in); length 14.63 m (48 ft 0 in); height 5.36 m (17 ft 7 in); wing area 43.11 m^2 (464 sq ft)

Armament: up to eight 12.7-mm (0.5-in) machine-guns in nose and two in rear dorsal position (later aircraft had electrically-operated turret), plus up to 1814 kg (4,000 lb) of bombs, comprising four 227-kg (500-lb) bombs internally and two 454-kg (1,000 lb) bombs on wing racks

USA

Douglas A-26 Invader

The demarcation between the true ground-support aircraft and the so-called light bomber was conveniently defined by the American 'attack' designation; nevertheless the **Douglas A-26 Invader** leaned much closer to the latter category in that its battlefield operations were more of the set-piece strike and less of the ad hoc attack.

Although three parallel versions were originally conceived (a night-fighter, a level bomber and an attack aircraft) the last-named version was selected for initial production and eventually entered combat service as the **A-26B** with the US 9th Air Force in Europe in November 1944. This version carried six heavy machine-guns in the nose, sometimes supplemented by eight in underwing packs, and by locking the dorsal turret guns to fire forward, making a total of 16 forward-firing guns! The cabin and fuel tanks were heavily armoured to withstand ground small-arms fire, and a total of 1814 kg (4,000 lb) of bombs was carried internally.

Though obviously a very powerful weapon to unleash over the battlefield (and even more so when underwing 127-mm/5-in rocket projectiles were added to its arsenal) the Invader enjoyed only partial success as a truly tactical support aircraft in Europe, being found generally unsuitable for operations from forward airfields unless such facilities were captured wholly intact. It was for this reason, and the length of time taken to reach the front line from bases in the distant rear, that A-26 attacks were largely confined to fixed targets such as airfields and bridges, and these were more fre-

This formation of A-26s of the 386th Bomb Group en route to Germany in April 1945 contains aircraft with both glazed nose for bomb-aimer and solid nose packed with machine-guns. They also carry machine-gun packs under the wings.

quently and effectively struck by the larger resources of medium bombers available.

For the 'island-hopping' nature of the Pacific war against Japan, the USAAF employed the **A-26C** which retained a bombardier in place of the nose gun battery to facilitate bombing from medium altitude, and as such the Invader was operated almost exclusively as a conventional medium bomber.

Douglas A-26B Invader of the 552nd Bomb Squadron, 386th Bomb Group, 9th Air Force based at Beaumont-sur-Oise in April 1945. The Invader also saw valuable service over the hotly contested islands of Japan during the last few months of the war.

Specification
Douglas A-26B Invader
Type: three-seat tactical support aircraft
Powerplant: two 2,000-hp (1492-kW) Pratt & Whitney R-2800-27 air-cooled radial piston engines
Performance: maximum speed 572 km/h (355 mph) at 3660 m (12,000 ft); climb to 3050 m (10,000 ft) in 8 minutes 6 seconds; service ceiling 6735 m (22,100 ft); range 2255 km (1,400 miles)
Weights: empty 10147 kg (22,370 lb); maximum take-off 15876 kg (35,000 lb)
Dimensions: span 21.34 m (70 ft 0 in); length 15.24 m (50 ft 0 in); height 5.64 m (18 ft 6 in); wing area 50.17 m² (540 sq ft)
Armament: six fixed forward-firing 12.7-mm (0.5-in) machine-guns in nose and two in each of dorsal and ventral turrets, plus an internal bombload of 1814 kg (4,000 lb) and an external load of up to 907 kg (2,000 lb) of bombs, or up to 16 127-mm (5-in) rocket projectiles

USA

Lockheed P-38 Lightning

The **Lockheed P-38 Lightning** is, like its famous partners (the Republic P-47 and North American P-51), best remembered as a pure fighter both in the European and Pacific theatres. Yet from mid 1942 the P-38F destined for the USAAC possessed external racks for up to 907 kg (2,000 lb) of bombs. (Although the Lightning was originally ordered for the RAF, the ban on export of turbosuperchargers so compromised the aircraft's performance that it did not enter British service.)

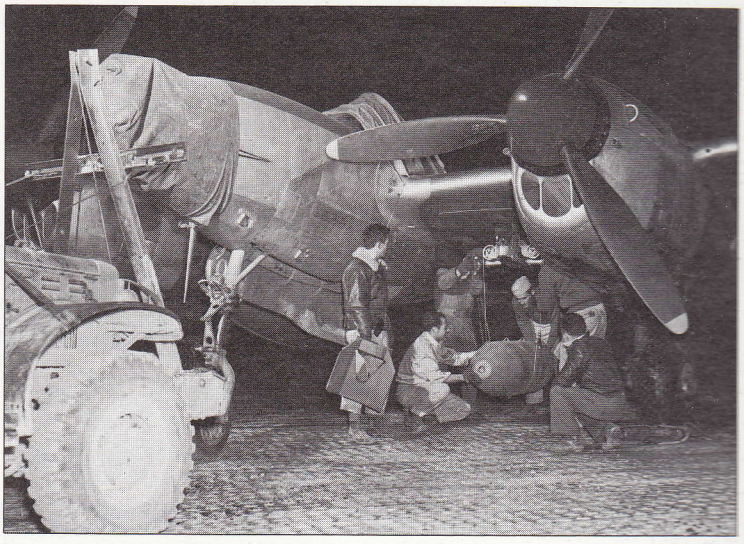
USAAF fighter groups began flying **P-38F** aircraft in Europe and North Africa during 1942, but the aircraft proved disappointing in combat against German fighters, and it was in the last stages of the Tunisian campaign that the aircraft began to demonstrate its capabilities as a ground-support fighter, bombing and machine-gunning the Axis forces in their final withdrawal to Tunis and Bizerta.

The introduction of the much improved **P-38J** (identifiable by its 'chin' radiators) resulted in a new lease of life as an escort fighter, particularly during the 1943 daylight Boeing B-17 and Consolidated B-24 raids over Europe, but in 1944, as deliveries of P-47s and P-51s were stepped up to the UK and the Mediterranean, the P-38J and the more powerful **P-38L** version came to be used more and more in the ground-attack role, both versions being capable of lifting a pair of 726-kg (1,600-lb) bombs. The P-38L was also modified to carry 10 69.8-mm (2.75-in) rockets on 'Christmas-tree' tiers under the wings; it was also the first Allied fighter-bomber to drop napalm bombs on the Germans in the latter half of 1944.

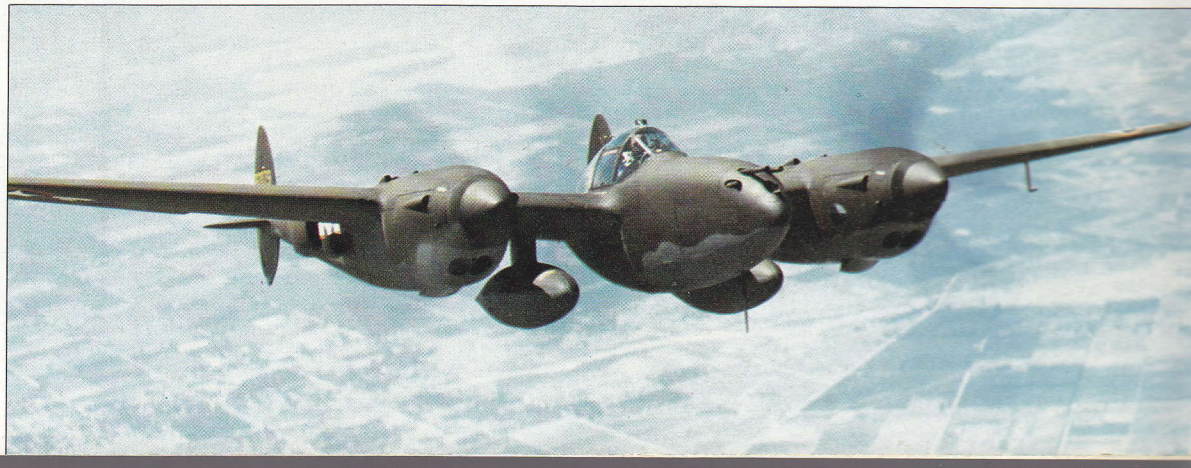
The ability of the P-51D to escort the daylight heavy bombers all the way to Berlin rendered use of the P-38 as a long-range fighter superfluous, and the type was employed almost exclusively as a support fighter-bomber during the last six months of the war, and a new tactic emerged involving the use of a two-seater P-38 'lead ship' complete with bombardier; the aircraft would lead a formation of single-seaters and, using its very accurate Norden bomb sight, would control the bombing of the entire formation. A refinement of this, involving bombing-through-overcast (BTO) radar in the lead ship, was intended to enable close support to be given in conditions of bad weather over the ground battle, but in one of the only occasions it was employed with any numbers of P-38s (during the Battle of the Ardennes) heavy casualties were caused when most of the bombs dropped fell among American armoured vehicles.

Due to its size and performance, the P-38 Lightning proved an excellent ground attack aircraft, able to carry rockets and bombs large distances into enemy territory. This is a P-38L serving with the 97th FS, 82nd FG, USAAF.

A theatre in which the P-38 excelled was the Mediterranean. This P-38L of the 94th Fighter Group is having a bomb winched on to its wing rack somewhere in Italy. During the height of the campaign, operations continued through the night.



The Lightning had exceptional performance for a twin-engined aircraft and the secret of this lay in the small frontal area made possible by the twin boom layout. The position of the racks for either bombs or, as here, fuel tanks is clearly visible.



Specification
Lockheed P-38L Lightning
Type: single-seat fighter-bomber
Powerplant: two 1,475-hp (1100-kW) Allison V-1710-111/113 liquid-cooled inline piston engines
Performance: maximum speed 667 km/h (414 mph) at 7620 m (25,000 ft); climb to 6095 m (20,000 ft) in 7 minutes; service ceiling 13410 m (44,000 ft); range on internal fuel 730 km (454 miles)
Weights: empty 5806 kg (12,800 lb); maximum take-off 9798 kg (21,600 lb)
Dimensions: span 15.85 m (52 ft 0 in); length 11.53 m (37 ft 10 in); height 3.00 m (9 ft 10 in); wing area 30.42 m² (327.5 sq ft)
Armament: one 20-mm and four 12.7-mm (0.5-in) guns in the nose, plus a bombload of two 726-kg (1,600-lb) bombs, or 10 69.8-mm (2.75-in) rocket projectiles together with two 1173-litre (258-gal) drop tanks if required

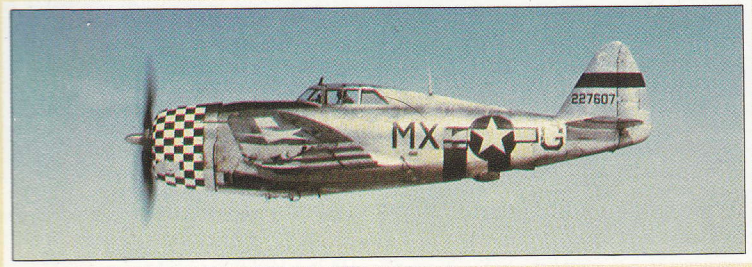
Fighter-bombers in Normandy

As the troops hit the beaches in the Normandy invasion, the air was full of aircraft keeping the German ground forces at bay. Most were of the fighter-bomber type and many thousands of sorties were flown. When it was time to break out from the beach-head, it was the fighter-bombers which broke the German resistance with constant 'cab-rank' attacks.

Profiting from three years' experience in cross-Channel combined operations against the French coast, not to mention the large-scale amphibious invasions in the Mediterranean theatre, the Allies assembled a huge armada of air power with which to cover the biggest seaborne invasion in history, the Normandy landings, scheduled for early June 1944. In direct support of the invasion itself (and excluding some 3,460 heavy bombers) the Allied Expeditionary Air Force comprised 315 squadrons, a total of 9,370 medium and light bombers, fighters, fighter-bombers and transport aircraft. Of these, 5,409 were fighters and fighter-bombers in 124 RAF and 74 USAAF squadrons. Against them were ranged an estimated force of about 900 German aircraft, of which fewer than 500 were reckoned to be immediately available to dispute the invasion. Subsequent records show that in fact the Luftwaffe fielded no more than some 350 aircraft capable of being ordered off at short notice.

In the event tactical surprise was largely achieved during the landings themselves on 6 June, the Germans being partly deceived into believing that the main blow would fall elsewhere, and the large numbers of Hawker Typhoons, Supermarine Spitfires, de Havilland Mosquitoes, Lockheed P-38s, Republic P-47s and North American P-51s sent to cover the beaches were scarcely in demand, so that armed reconnaissance became the order of the day. Pre-invasion bombing and supporting naval gunfire proved more than adequate to counter the enemy's fixed defences. Activity by the Luftwaffe was minimal, fewer than 400 sorties being flown by the Germans in the first 48 hours, compared to the Allies' total of 14,674 on D-Day alone.

When on 8 June, however, the Germans eventually reacted by ordering large



Thunderbolts proved to be hard-hitting attack aircraft and flew many missions at low level over the Normandy countryside.

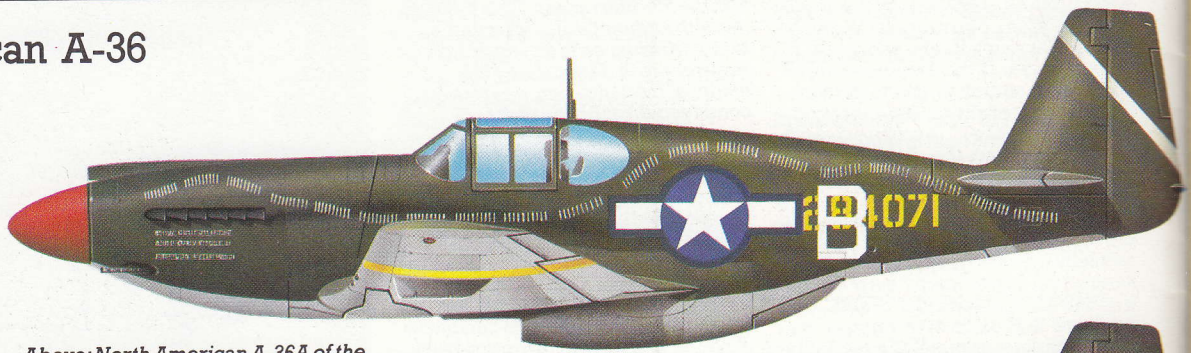
A Lightning buzzes over a French airfield in October 1944 with wrecked German aircraft forming a suitable foreground.

USA

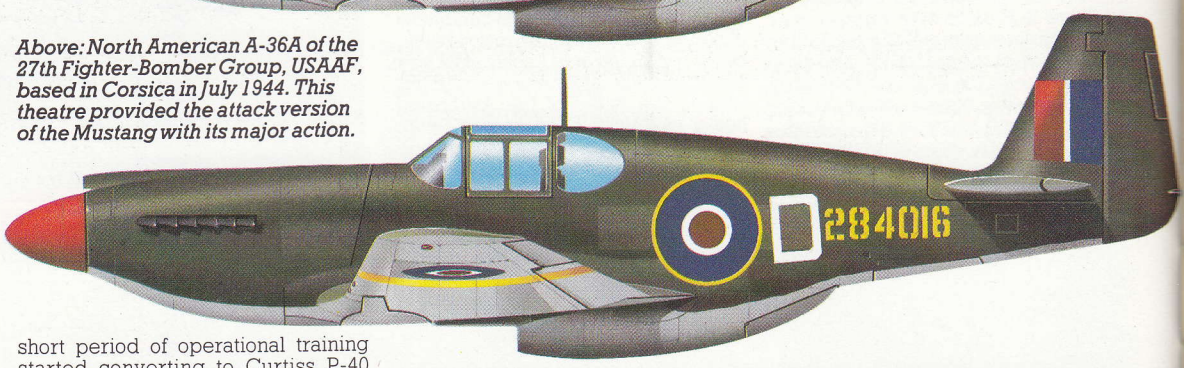
North American A-36

The famous North American P-51 Mustang fighter originated in a British requirement placed with the manufacturers some two years before the USA entered the war. The United States Army had the nerve to stipulate that two examples be delivered free of charge for evaluation by the US Army Air Corps but, despite their outstanding performance, they were simply not needed. The outbreak of war with Japan prompted the USAAF to place production orders for the aircraft, to be employed in the 'attack' category as the **North American A-36**. US concepts of close-support aircraft in the modern war environment were generally muddled in 1942, and until the creation of bombardment groups (dive) there was no clear indication as to what units (or indeed what tactics) would be employed. The **A-36A**, which first flew in September 1942, featured hydraulically-operated dive brakes on both upper and lower surfaces of the wings, as well as wing racks for two 227-kg (500-lb) bombs; it was assumed that, in emulating the Junkers Ju 87, the A-36 would engage in steep dive attacks, yet be capable of defending itself (which the German aircraft was not) with its six-gun 'fighter' armament. Production of 500 aircraft was completed in 1943, by which time the pure fighter-bomber, which generally attacked from low level in relatively level flight, had emerged as the true and the most effective ground-attack aircraft.

A-36s saw prolonged operational service. Most noteworthy of the combat units were the 86th and 311th bomb Groups (Dive), both later renamed Fighter-Bomber Groups. The former arrived with A-36s in North Africa in March 1943, but after only a relatively short period of operational training started converting to Curtiss P-40 Warhawks. The 311th arrived in South East Asia with A-36As in mid-1943 and, operating from bases in India, supported Allied ground forces in Burma, as well as attacking the Japanese airfields at Myitkyina and Bhamo; before eventually converting to P-51s, the group's A-36s also flew numerous missions in support of Merrill's Marauders. To provide trained pilots for these two operational groups, the 48th and 85th Bomb Groups (Dive) received A-36As early in 1943 but remained in the USA for training purposes, until re-equipped with Republic P-47s. No effort was made to improve the A-36 as, by the time it reached operational service, it was becoming clear that the Packard Merlin-powered P-51 would be far more efficient not only as a long-range fighter but as an excellent ground-support fighter.

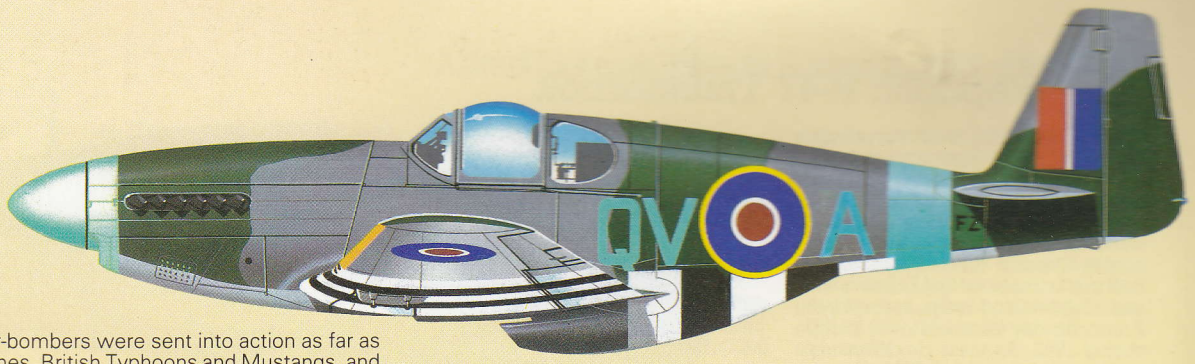


Above: North American A-36A of the 27th Fighter-Bomber Group, USAAF, based in Corsica in July 1944. This theatre provided the attack version of the Mustang with its major action.



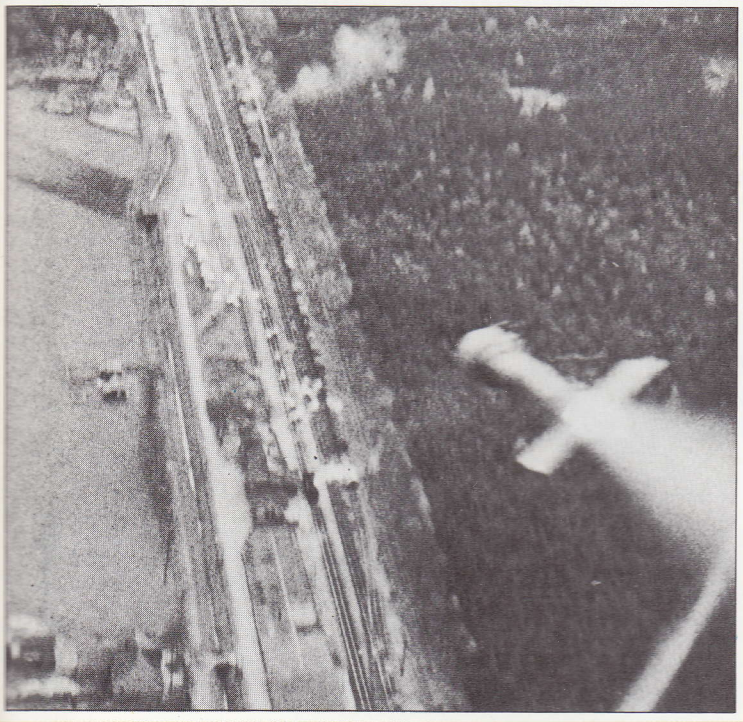
Above: One A-36A (also known as the Invader) was transferred to the RAF for evaluation in the attack role.

Specification
North American A-36A
Type: single-seat fighter-bomber
Powerplant: one 1,325-hp (988-kW) Allison V-1700-87 liquid-cooled V-12 piston engine
Performance: maximum speed 499 km/h (310 mph) at 1525 m (5,000 ft); service ceiling 7650 m (25,100 ft); range 885 km (550 miles)
Weights: empty 2998 kg (6,610 lb); maximum take-off 4536 kg (10,000 lb)
Dimensions: span 11.28 m (37 ft 0 in); length 9.83 m (32 ft 3 in); height 3.71 m (12 ft 2 in); wing area 21.65 m^2 (233 sq ft)
Armament: four wing-mounted and two fuselage-mounted 12.7-mm (0.5-in) machine-guns, plus a bombload of two 227-kg (500-lb) bombs



No. 19 Sqn flew its Mustang Mk IIIs on strafing patrols during the build up to D-Day from Ford in Sussex, and were one of the first squadrons to arrive in France. Although strictly a fighter, the P-51 could carry ground attack weapons.

forces to Normandy, the Allied fighter-bombers were sent into action as far as 80 km (50 miles) inland from the beaches, British Typhoons and Mustangs, and American P-38s and P-47s attacking anything that appeared on road, rail or river to paralyse all movement by enemy forces attempting to reach the lodgement area; rather than bring home their bombs and rockets, pilots were ordered to attack any building or copse they suspected might be concealing an enemy tank or truck. Opposition in the air was still limited to isolated appearances by Focke-Wulf Fw 190s, but these were invariably handled by RAF Spitfires and American P-51s; 28 fighter-bombers were lost on 7 and 8 June, all but four to German Flak which, as usual, was heavily distributed among the road and rail traffic. On the other hand the Panzer Lehr Division on 7 June alone suffered the loss of 80 trucks carrying equipment and ammunition, 40 fuel lorries, 84 half-tracks and numerous pieces of artillery to the ravages of the fighter-bombers – all before even coming into action.



Above: The view from a Typhoon as one of its rockets streaks towards a German train. Breaking the supply lines was vital to Allied success.

By 10 June the first of the advanced landing strips had been completed in Normandy, at first as emergency fields for damaged fighters but soon, as ammunition and fuel were delivered, for operations by the ground-support fighters. The choking Normandy dust that pervaded these strips during those summer days proved a serious handicap for the Spitfires, Typhoons, P-38s and P-51s, but the P-47s were less prone to the troubles and were soon frequently called into action against the German forces within sight of the strips selves. And at Camilly even the Typhoons took off, climbed to 2440 m (8,000 ft) over the sea, turned, dived and discharged their rockets almost over the strip, and landed to replenish after sorties that had been of no more than 9-minute duration.

As the breakout from the beach-head started, the fighter-bombers began their 'cab rank' tactics, flying constant patrols above the ground battle, their pilots in radio contact with ground controllers riding in army vehicles with the leading troops. As a measure of the scale of activity by the RAF fighter-bombers the achievements of a single day, 18 July, serve graphically: armed reconnaissance by 51 Mustangs, 74 Typhoons and 60 Spitfires claimed 14 enemy armoured vehicles destroyed and 32 damaged; 472 Typhoons and 20 Mustangs on ground support sorties claimed 11 armoured vehicles destroyed and nine damaged; Spitfires destroyed five enemy aircraft for the loss of three; and eight Typhoons were lost.

On the previous day, Spitfire pilots of No. 602 Squadron, RAF, spotted a staff car near the hamlet of Sainte Foy de Montgomerie; in avoiding the gunfire from the fighters, the car overturned, hurling the occupants into a ditch. Erwin Rommel, famous commander of the German forces, survived with a fractured skull, only to commit compulsory suicide three months later.

Above: As well as attacks on enemy armour, the P-47s were also used to report their position to Allied tanks using radio.

Below: Along with the Thunderbolt, the Typhoon was one of the most important ground-attack aircraft in the Allied inventory.

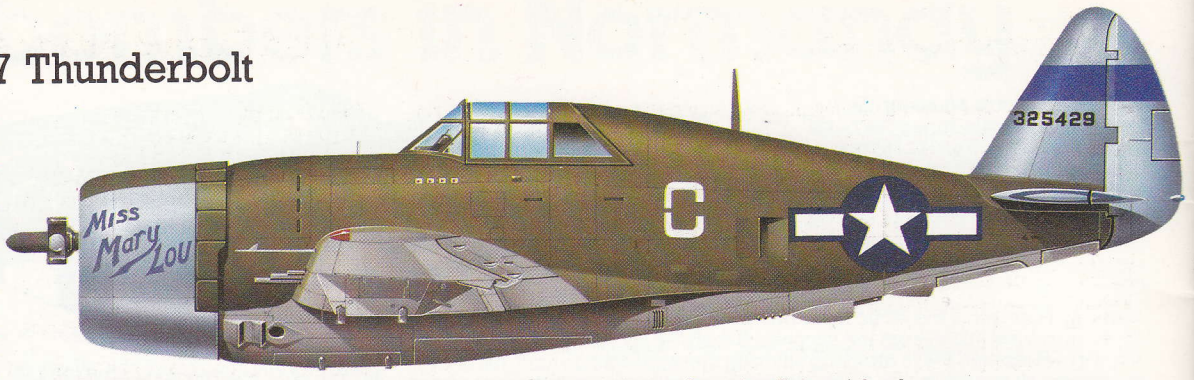
USA

Republic P-47 Thunderbolt

The big **Republic P-47 Thunderbolt** served for more than a year before being seriously considered for service as a ground-support aircraft; indeed, after considerable misgivings as to whether it would be able to match the nimble German interceptors in dog-fighting, it came to represent a vital and effective long-range escort for the American day bombers over Europe during 1943. As mass production got under way (a total of 15,579 being ultimately produced) the **P-47D-25** introduced underwing bomb racks capable of mounting a pair of 454-kg (1,000-lb) bombs, in addition to a 568-litre 125-gal drop tank under the fuselage. In due course the **P-47D-30** was capable of carrying up to 1134 kg (2,500 lb) of external ordnance, including up to 10 127-mm (5-in) rocket projectiles.

P-47D fighter-bombers first entered service with the 348th Fighter Group in Australia, whence they were flown against Japanese targets in New Guinea. They were then issued to fighter and fighter-bomber groups of the US 9th and 15th Air Forces in the UK and the Mediterranean theatre. From mid-1944, as the superlative North American P-51D assumed the lion's share of air combat and escort duties over Europe, the P-47D was assigned more and more of the close-support work over the Allied armies advancing through Italy and France, proving immensely strong in the punishing ground-attack role.

A total of 826 Thunderbolts was delivered to the RAF, of which the majority were equivalent to the P-47D-25 and designated **Thunderbolt Mk II.** They entered service with the RAF in India and Burma in the summer of 1944, eventually serving with Nos 5, 30, 34, 42, 60, 79, 81, 113, 123, 131, 134, 135, 146, 258, 261 and 615 Squadrons. Flying over the Burma jungle the 'cab rank' patrols that were being used to such good effect by Hawker Typhoons in Europe, these excellent fighter-bombers gave constant support to the 14th Army during its final victorious advance towards Rangoon in the last year of the war. Time and again the Thunderbolts were called down by the mobile control officers to eliminate some Japanese strongpoint with guns and bombs. The P-47 and the Typhoon were the best American and British fighter-bombers of the year.



P-47D (razorback) of the 19th Fighter Squadron, 218th Fighter Group, based on Saipan island in the Marianas during July 1944. The 'Jug' was a hardy fighter, and the fierce war fought in the Far East suited its strength and speed.

As the P-51D took over in the long-range escort role, more P-47s were released to attack duties. This example served with the 352nd Fighter Squadron, 353rd Fighter Group at Gaydon at the time of the Normandy invasion, and features the 'bubble' cockpit.

Specification

Republic P-47D-25 Thunderbolt
Type: single-seat fighter-bomber
Powerplant: one 2,000-hp (1492-kW) Pratt & Whitney R-2800-59 air-cooled radial piston engine
Performance: maximum speed 689 km/h (428 mph) at 9145 m (30,000 ft); climb to 6095 m (20,000 ft) in 9 minutes; service ceiling 12800 m (42,000 ft); range on internal fuel 765 km (475 miles)
Weights: empty 4536 kg (10,000 lb); maximum take-off 8808 kg (19,400 lb)
Dimensions: span 12.42 m (40 ft 9 in); length 11.00 m (36 ft 1 in); height 4.32 m (14 ft 2 in); wing area 27.87 m² (300 sq ft)
Armament: eight fixed forward-firing 12.7-mm (0.5-in) machine-guns in wings, plus two 454-kg (1,000-lb) bombs or six 69.8-mm (2.75-in) rocket projectiles under the wings

This 12th Air Force P-47 in Italy demonstrates the three main weapons of the wartime fighter-bomber, namely machine-guns, bombs and rockets. Such aircraft were the workhorses of the Allied drive up the Italian mainland.

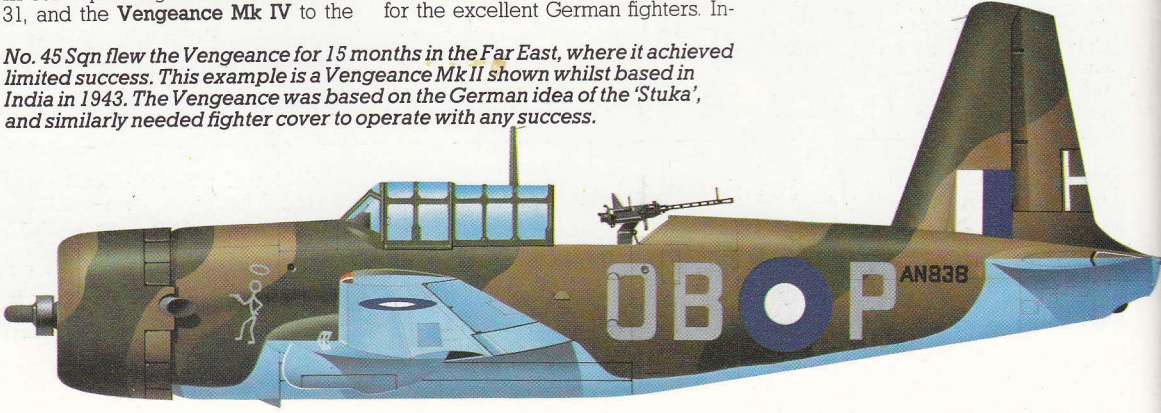
USA

Vultee Vengeance

Powerfully influenced by the successes achieved by the German Junkers Ju 87 dive-bomber in the early months of the war, the British in 1940 ordered several hundred **Vultee V-72** aircraft from the USA, a type that had not then been selected for the US Army Air Corps, and production lines were established at Vultee's Nashville plant and the Northrop plant at Hawthorne, California. Before the first British aircraft was delivered in 1942, however, the United States had entered the war, and further aircraft were ordered for the USAAF. The American aircraft (designated the **A-31** and **A-35**, but generally referred to as the V-72) did not match up to expectations and almost all were relegated to target-towing and other training duties from the outset.

The Vengeance saw considerably more service in the RAF, a total of 1,205 being delivered, the **Vengeance Mk I, Vengeance Mk II** and **Vengeance Mk III** corresponding to the American A-31, and the **Vengeance Mk IV** to the A-35. Tests with the first Vengeance Mk 1s led to numerous alterations, and it was not until late 1942 that deliveries started in earnest. By that time the tactical weakness of the dive-bomber had been recognized, and it was decided not to employ the Vengeance in Europe where it would be easy prey for the excellent German fighters. Instead the type was sent to equip RAF squadrons in India and Burma where, operating under top cover provided by Hawker Hurricanes (and later by Supermarine Spitfires and Republic Thunderbolts), it would represent the

No. 45 Sqn flew the Vengeance for 15 months in the Far East, where it achieved limited success. This example is a Vengeance Mk II shown whilst based in India in 1943. The Vengeance was based on the German idea of the 'Stuka', and similarly needed fighter cover to operate with any success.



best weapon against difficult jungle targets.

The Vengeance was first in action in July 1943 in Burma, having started to replace the veteran Bristol Blenheim with the RAF; it eventually equipped four squadrons (Nos 45, 82, 84 and 110) as well as several in the Indian Air Force. As expected, however, the Vengeance proved extremely vulnerable in the presence of Japanese fighters and so seldom ventured abroad without strong fighter escort. The type did nevertheless prove very effective during the Arakan campaign, and in a number of successful raids destroyed a large number of Japanese vehicles and quantities of stores being assembled in the jungle.

By the last year of the war conventional fighter-bomber tactics were seen as the best means of ground support, and demands for the Vengeance diminished rapidly. By mid-1945 most had been relegated to target-towing duties.

Specification

Vultee Vengeance Mk I
Type: two-seat dive-bomber
Powerplant: one 1,700-hp (1268-kW) Wright R-2600-A5B-5 air-cooled radial piston engine
Performance: maximum speed 449 km/h (279 mph) at 4115 m (13,500 ft); climb to 4570 m (15,000 ft) in 11 minutes 18 seconds; service ceiling 6795 m (22,300 ft); range 1930 km (1200 miles)
Weights: empty 4672 kg (10,300 lb); maximum take-off 7440 kg (16,400 lb)
Dimensions: span 14.63 m (48 ft 0 in); length 12.12 m (39 ft 9 in); height 3.91 m (12 ft 10 in); wing area 30.84 m² (332 sq ft)
Armament: four wing-mounted 7.62-mm (0.3-in) machine-guns and two 7.62-mm (0.3-in) machine-guns in the rear cockpit, plus a bombload of four 227-kg (500-lb) bombs carried internally

USSR

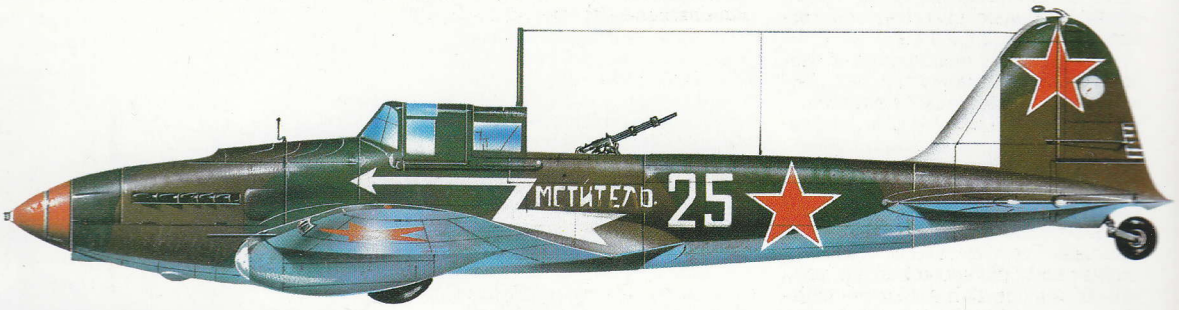
Ilyushin Il-2

The Soviet **Ilyushin Il-2** succeeded where the British Fairey Battle had failed. Immense strength and armoured protection, powerful armament and committal to combat under heavy fighter protection all combined to render the *bronirovannyi shturmovik* (armoured assault aircraft) a decisive weapon in the Soviet armoury during the final two years of the war in Europe.

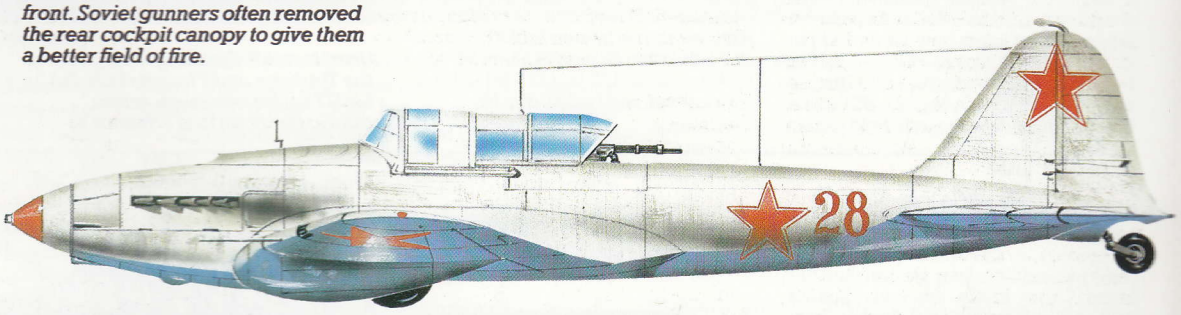
Christened the 'flying tank' by the Soviet infrantrymen, and the *schwarzer Tod* (Black Death) by the men of the German army, the Il-2 originated as a two-seater but was modified to a single-seater and in this form was entering service with the V-VS at the time of Germany's invasion of the USSR on 22 June 1941. However, in those early months of almost total German air supremacy the early Il-2s emerged amidst a welter of criticism, being found to lack punch against the enemy's armoured fighting vehicles (their principal targets) and hopelessly vulnerable in the presence of enemy fighters.

The aircraft accordingly underwent rapid redesign, the great armoured 'bath' that constituted the pilot's cockpit being extended to accommodate a rear gunner with heavy-calibre machine-gun. The 1,680-hp (1253-kW) AM-38 engine was replaced by a 1,750-hp (1306-kW) AM-38F, and the two wing-mounted 20-mm ShVAK cannon gave place to high muzzle velocity 23-mm VYa guns.

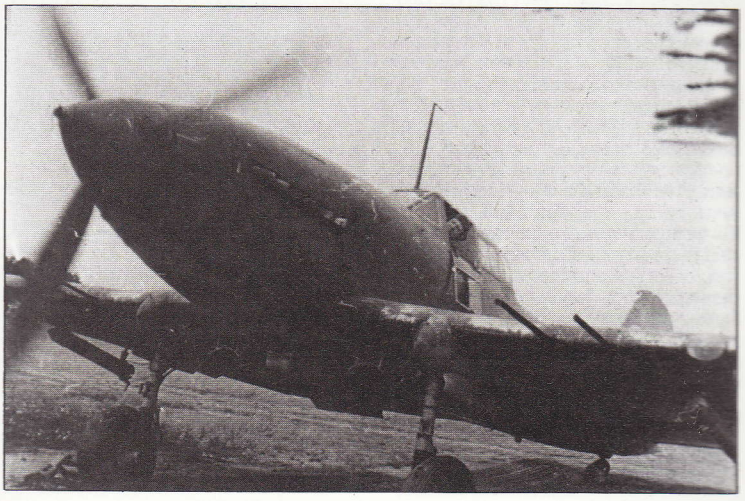
The new two-seater **Il-2m3** entered service from August 1942, and thereafter gun, bomb and rocket armament underwent progressive increase as the production accelerated. By the winter of 1943-4 vast numbers of Il-2m3s were in service (some sources put the number as high as 12,000), and remained in constant use up to and beyond the end of the war in Europe. Their use in combat was almost invariably confined to attacks from extremely low level, often no more than 6 m (20 ft), the favourite tactic being to circle to the rear of enemy forces in single line-ahead stream to attack the thinly-armoured rear of German tanks. Many *shturmovik* pilots were holders of the Gold Star of Hero of the Soviet Union, and women pilots were by no means rare. The Il-2m3 proved to be extremely popular among its crews, particularly on account of its ability to survive battle damage, many aircraft returning to base riddled by enemy ground fire, the armoured 'bath' alone remaining unscathed. More Il-2s were built (36,183) than any other single type of aircraft.



An Il-2m3 in late 1944 on the Eastern front. Soviet gunners often removed the rear cockpit canopy to give them a better field of fire.



During the winter, the Il-2s were quickly painted with a soluble white scheme over their normal camouflage. This Il-2 served over the battlefields of Stalingrad in 1943.



Armed with heavy cannon and rockets, and with bomb racks under the wings, the Il-2s of the V-VS flew over all the battlefields of the Eastern Front in vast numbers. This ability to absorb massive amounts of battle damage made them popular with their crews.

Specification

Ilyushin Il-2m3 (late model)
Type: two-seat assault aircraft
Powerplant: one 1,770-hp (1320-kW) Mikulin Am-38F liquid-cooled inline piston engine
Performance: maximum speed 404 km/h (251 mph) at 760 m (2,500 ft); service ceiling 5945 m (19,500 ft); range 600 km (375 miles)
Weights: empty 4525 kg (9,976 lb); maximum take-off 6360 kg (14,021 lb)
Dimensions: span 14.60 m (47 ft 10¾ in); length 11.60 m (38 ft 0½ in); height 3.40 m (11 ft 1½ in); wing area 38.54 m² (414.4 sq ft)
Armament: (typical) wing-mounted armament of two 37-mm (1.46-in) and two 7.62-mm (0.3-in) guns, and one 12.7-mm (0.5-in) machine-gun in the rear cockpit, plus 200 2.5-kg (5.5-lb) PTAB hollow-charge anti-tank bombs, or eight RS-82 or RS-132 rocket projectiles

USSR

Lavochkin La-5 and La-7

Syemyon Lavochkin's excellent fighters, the **Lavochkin La-5** and **La-7**, were among the best Soviet fighters produced during the war, their relatively simple, mainly wooden structure assisting the production of large numbers, and their large, air-cooled radial engines making for ease of maintenance in the bleak, cold Russian winters.

Developed in turn from the LaGG-1 and LaGG-3 of 1940-1, and the LaG-5 of 1941, the La-5 passed its state acceptance trials in May 1942 and, in view of the successive disasters being suffered at the hands of the Luftwaffe, was ordered into large-scale production, more than 1,000 aircraft being completed in the first six months. Despite some early troubles with the M-82 radial, in a most advanced installation, the La-5 entered squadron service with the V-VS in the autumn of 1942 and first saw widespread combat during the Stalingrad campaign that started in November

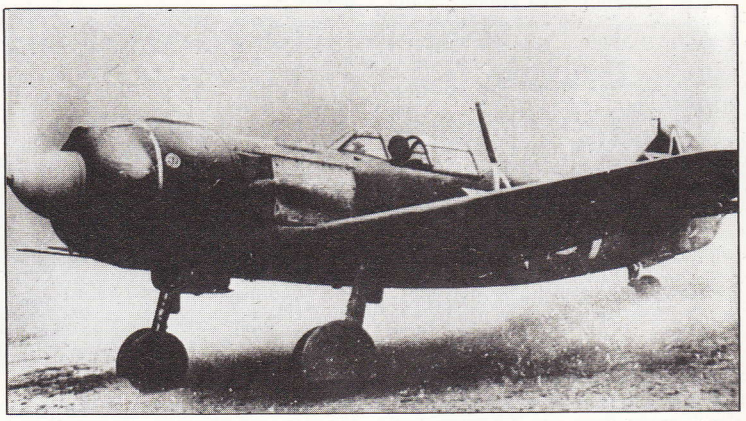
This Lavochkin La-5FN was presented to the V-VS by a Mongolian collective. The La-5 was a good all-round aeroplane and its low-level performance suited it well to the ground-attack role, often carrying rocket launchers.

that year. The La-5 was essentially a low-altitude fighter, well capable of holding its own against the Focke-Wulf Fw 190 and Messerschmitt Bf 109 below about 3700 m (12,140 ft) and it was its good performance at low level that encouraged the La-5's employment in the ground-support role; in the great Battle of Kursk at least two regiments of La-5s were flown as anti-tank aircraft with rockets and hollow-charge bombs, which were particularly effective against lightly-armoured fighting vehicles. The **La-5FN** (*forsirovannyi nyeposredstvenno*, or direct fuel-injection engine) was the most widely used sub-variant.

In mid-1944 a development of the La-5, the La-7, was introduced with numerous alterations, such as improved location of oil cooler intakes and changes in the cockpit outline. However, despite its improvements, production of the La-5FN was not terminated and both aircraft continued to operate side-by-side for the remainder of the war. The La-7 was seldom employed in the ground-attack role, usually being flown as top cover while the earlier aircraft attacked German army targets with the growing arsenal of assault weapons. Almost all the most famous Soviet pilots flew La-5s and La-7s, among them Colonel Generals Ivan Kojedub (who destroyed 62 German aircraft, including a jet Me 262 while flying Las) and Aleksandr Pokryshkin (59 kills); both these pilots were three-time recipients of the Gold Star, the only airmen thus decorated.

Specification

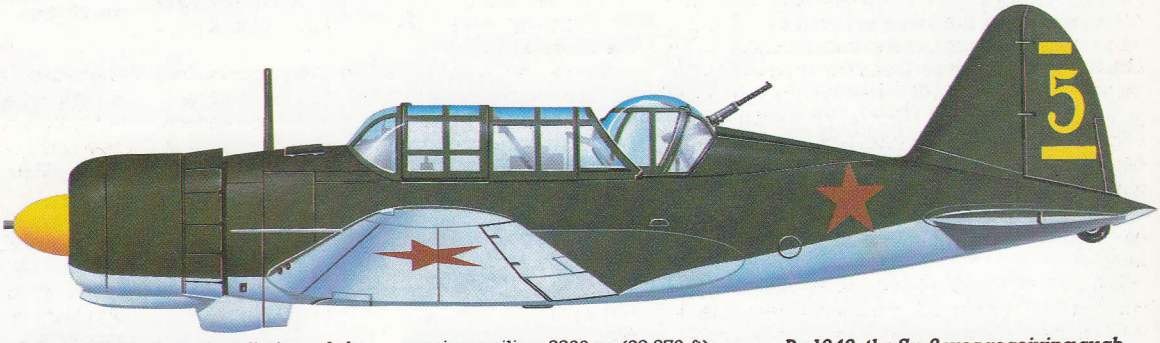
Lavochkin La-5FN
Type: single-seat fighter-bomber
Powerplant: one 1,650-hp (1230-kW) Shvetsov M-82FN (ASh-82FN) air-cooled radial piston engine
Performance: maximum speed 647 km/h (402 mph) at 5000 m (16,405 ft); climb to 5000 m (16,405 ft) in 4 minutes 42 seconds; service ceiling 10000 m (32,810 ft); range 700 km (435 miles)
Weights: empty 2800 kg (6,173 lb); maximum take-off 3360 kg (7,408 lb)
Dimensions: span 9.80 m (32 ft 2 in); length 8.67 m (28 ft 5⅓ in); height 2.54 m (8 ft 4 in); wing area 17.59 m² (189.34 sq ft)
Armament: two 20-mm ShVAK cannon and either four 82-mm (3.23-in) RS-82 rockets or four 150-kg (331-lb) bombs; later aircraft had two 23-mm NS cannon



Used in much the same roving role as the Typhoon and Thunderbolt, the La-5/7 series saw much action during the victorious advance to Berlin, flying ahead of the Soviet tanks and attacking German positions with light bombs and rockets.

USSR

Sukhoi Su-2



Only a marginally later design than the British Fairey Battle, the Soviet **Sukhoi Su-2**, designed by Pavel Sukhoi, previously of the Tupolev design bureau, entered service with the V-VS early in 1941 but, as far as is known, was not encountered during the Winter War which ended the previous year. Derived from Sukhoi's **ANT-51** and designated **BB-1** during its early trials, the aircraft was fairly efficient by current standards once the M-87 engine had been replaced by the M-88 and then the M-88B. Tactical concepts changed swiftly during the first two years of the war, however, and the use by the Germans of large forces of single-seat fighters in support of their advancing armies came as a body blow to the Soviets in mid-1941. Despite being further improved by installation of the 1,000-hp (746-kW) M-88B radial, the Su-2 was found to be desperately vulnerable and virtually unable to defend itself with its single small-calibre machine-gun in the unwieldy manually-operated dorsal turret. Estimates suggest that about 100 were in service with the *Frontovaya Aviatsya* at the time that the German army rolled into the Soviet Union in June 1941, but that dozens were shot down by Flak and fighters in the first few disastrous weeks; moreover, such was the generally poor standard of training in the Soviet air force that the Su-2 proved almost useless as a weapon against mobile battlefield targets.

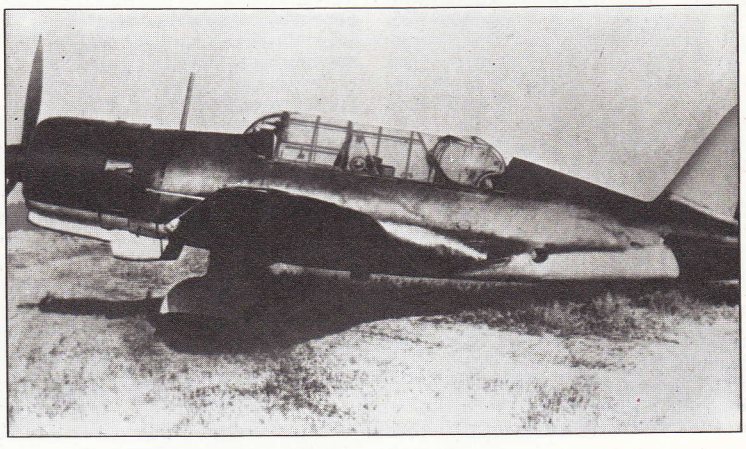
The parlous state of the Soviet aircraft industry in 1941 prevented much being done to remedy the immediate lack of suitable ground support aircraft (until production of the two-seat Il-2m3 could be stepped up) and recourse was made to further attempts to improve the Su-2 by installation of the 1,520-hp (1134-kW) M-82 radial and frequent deletion of the dorsal turret, but with little tactical benefit. Accepting that losses would remain high, the Soviets therefore simply loaded the aircraft with further bombs and rockets on the supposition that the more explosive delivered against the enemy the better the chances of some degree of success. This version, as well as the completely redesigned **Su-6**, were abandoned in favour of all-out dependence on the Il-2m3. The Su-2 probably did not survive in production beyond mid-1942.

Specification

Sukhoi Su-2 (late production)
Type: two-seat close-support aircraft
Powerplant: one 1,520-hp (1134-kW) Shvetsov M-82 air-cooled radial piston engine
Performance: maximum speed 486 km/h (302 mph) at 1525 m (5,000 ft); service ceiling 8800 m (28,870 ft); range with bomb load 1100 km (683 miles)
Weights: empty 3273 kg (7,216 lb); maximum take-off 4700 kg (10,362 lb)
Dimensions: span 14.30 m (46 ft 11 in); length 10.46 m (34 ft 3¾ in); height 3.80 m (12 ft 6 in); wing area 29.0 m² (312.1 sq ft)
Armament: four fixed forward-firing 7.62-mm (0.3-in) machine-guns in wings and one or two in dorsal turret, plus a bombload of 400 kg (882 lb) carried internally and either bombs or rockets up to about 500 kg (1,102 lb) carried externally

A Sukhoi Su-2 with the 746-kw (1000-hp) M-88B radial engine. Owing to the type's obsolescence and vulnerability, engines of increasing power were tried, but without success. When the Il-2 became generally available, the Su-2 was relegated to second-line units.

By 1942, the Su-2 was receiving such a battering from the German ground and air forces that it was quickly withdrawn to second-line units. This aircraft served with one such unit in the Sverdlovsk area in the winter of 1942.



French Army Part 2

Each armoured division has its own artillery regiment with 24 155 AU F1s. These are self-propelled tracked 155-mm (6.1-in) howitzers with a range of 23000 to 24000 m (25,155 to 26,245 yards), although recent ammunition developments may well increase this to 3300 m (36,090 yards). The other support regiment is formed by the engineers, who have the same functions in the French army as in any other in that they build the bridges, clear the way and lay mines. In all three of these aspects the French army lags somewhat behind other nations, although considerable efforts are being made to introduce some modern equipment. New mobile bridging is now being supplied to the 1e CA to replace equipment dating back to World War II, but specialist engineer tracked vehicles are in short supply and are mainly based on the light (and obsolescent) AMX-13. With mines the engineers are well up to date and now have modern electronically-fused mines that can be mechanically laid.

The armoured division strength is completed by the command and logistics regiment, which supplies the administrative staff, the military police and all the other support functions, but including a strong signals element.

In contrast the French army infantry division has only 6,900 men. Under the divisional headquarters come the usual engineers and administrative regiments, and there are three infantry regiments. The basic weapon of the infantry is still the rifle, and most French army units now have the 5.56-mm FA MAS but several units still use the 7.5-mm Modèle M1949/56 automatic rifle. The standard machine-gun is the 7.62-mm F1, which may be used in either a light (with bipod) or heavy (with tripod) form. Numbers of Browning 12.7-mm (0.5-in) heavy machine-guns are also used. The infantry also uses 60-mm and 81-mm mortars (some armoured divisions also have a strength of 12 120-mm/4.7-in heavy mortars).

Each of the three infantry regiments uses the wheeled VAB armoured personnel carrier, the divisional establishment of such vehicles being 370. The French army has a total VAB strength of 1,974. The infantry carry with them 72 MILAN firing posts, and more anti-armour support comes from the single armoured regiment which is equipped with the wheeled AMX-10RC with a 105-mm (4.13-in) gun. Each armoured regiment has 36 of these vehicles which are among the most heavily-armed wheeled vehicles in the world. Total AMX 10RC strength is 189.

For artillery each infantry division has 24 155 BF-50 towed 155-mm (6.1-in) howitzers and 18 120-mm (4.7-in) heavy mortars organized into an artillery regiment. The towed 155-mm (6.1-in) howitzers, of which there are 218, have an operational range of 18000 m (19,685 yards), but ammunition improvements may increase this to about 30000 m (32,810 yards). The towed 155-mm (6.1-in) howitzer is only now coming into service and some older equipments are still in use.

Pluton is a French-developed battlefield nuclear missile, armed with a 25-kt warhead and with a range of 120 km (75 miles). Five regiments, each with six launchers, are equipped with Pluton.

For anti-tank defence each infantry regiment has its own force of 12 VAB/HOT missile-armed vehicles and an air defence force of 58 20-mm cannon. Most of these cannon are of French manufacture, most being the 20-mm Tarasque (the armoured division has 134 20-mm cannon). Total 20-mm AA strength is 180, with another 780 on order. Other AA assets are some 390 30-mm and 40-mm towed guns in five regiments also operating 116 Roland SAMs and 69 SP twin 30-mm guns. There are additionally three SAM regiments with 69 HAWK missiles.

Not all the equipment in the French army is modern. For sheer reasons of cost some equipment used by even the front-line divisions is now showing its age. In this category must come the force of over 1,000 AMX-13 light tanks. Although armed with 75-mm (2.95-in) guns, these small tanks have proved to be less than successful when used in the Middle East. The 156 ENTAC anti-tank missiles and 83 SS.11s are now regarded as first-generation weapons and are due to be replaced, but large numbers of 89-mm LRAC projectors, also for anti-tank use, are only now reaching the troops. Mention must also be made of the Pluton heavy artillery missiles, for there are 46 of them in service. These large missiles have a range of up to 120 km (75 miles) and as they have nuclear warhead are regarded as a battlefield support missile.

The French army aviation regiments use mainly helicopters. Of these 206 are Aérospatiale Alouette IIs, while there are 68 Alouette IIIs armed with AS.11 anti-tank missiles. More anti-tank support is provided by 86 Aérospatiale SA 342M Gazelle helicopters armed with the HOT missile. For transport and general utility use there are 134 Aérospatiale SA 330 Pumas and 175 SA 341Fs. The fixed-wing element is still provided by the Cessna L-19 Bird Dog (40 still in use) and 19 Holste Broussards. Some 320 SA 341 and SA 342 helicopters are on order.

Although not part of the French army, mention should be made of the Gendarmerie. France has numerous types of police but the Gendarmerie is virtually an anti-insurgency army that is equipped not only with almost the full range of infantry weapons but also AMX-13 light tanks armed with 75-mm (2.95-in) guns, VBC-90 armoured cars with 90-mm (3.54-in) guns and large numbers of 81-mm mortars. It also has its own 'air force' liberally equipped with helicopters and six Cessna 206 fixed-wing aircraft, and has a small fleet of river patrol craft. Conscripts may find themselves serving with the Gendarmerie, which has a strength of 85,000 and in time of war would constitute a formidable home defence organization.

Since its introduction in 1966 the AMX-30 has become the mainstay of the French armoured divisions. It has also been exported successfully, with about half of the 2,000-plus production selling overseas. It is expected to remain in service until the 1990s.

Order of Battle

Eight armoured divisions
Four motorized rifle divisions
One Alpine infantry division
One marine infantry division
One parachute division
One sector force, Berlin (one infantry regiment and one armoured regiment)
One motorized brigade
Three logistic brigades
Five corps reconnaissance regiments
Two corps drone reconnaissance regiments
Three corps rifle regiments
Five corps artillery regiments
Five corps Pluton regiments
Eight corps air-defence regiments
Seven engineer regiments
Ten signal regiments
Eight transport regiments
Four independent engineer regiments
Two independent paracute regiments
One independent electronic warfare regiment
Six combat helicopter regiments
(Forming: one light armoured divison and one combat helicopter division)

Reserves

65 regiments forming 13 infantry divisions